THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

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BY
OXIDE OF IRON.

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See Advertisement in last week's JOURNAL, page 730.

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This apparatus effects the most intimate contact between the liquor with which it is supplied and the gas passing through it, resulting in the complete removal of all particles of tar, increasing the ammonia strength of the scrubber and condenser liquor, and removing a large proportion of other impurities—notably, carbonic acid. The Washer is intended to work in conjunction with a scrubber. It occupies little space, and is inexpensive. It has been in successful constant use for nearly three years, does not become clogged with tar or corroded by the action of the liquor or gases, it gives three inches of pressure, and only needs a supply of liquor to keep it in regular action without any further attention.

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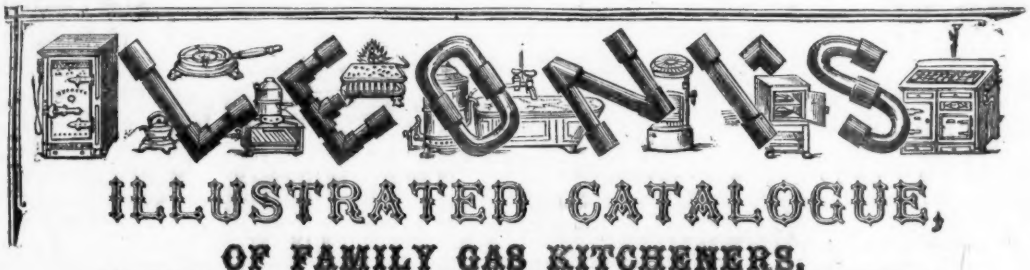

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Will be glad to supply the above on the most favourable terms, and to treat, by Purchase or Exchange, for Spent Oxide.

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IMPROVED HYDRAULIC CRANES,

Effecting a great saving in the cost of discharging Coals from Vessels, Barges, &c. Several of these Cranes, with the necessary power, are now being erected at Beckton, Hull, and other Gas-Works.

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Sixteen recently erected at Beckton, applied to Covers 30 feet square.

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IN SUCCESSFUL OPERATION AT THE NEW WORKS OF THE NEWCASTLE AND GATESHEAD GAS COMPANY, AND IN COURSE OF ERECTION AT THE CARLISLE CORPORATION GAS-WORKS.

Special "REGULUS COCKS" manufactured to stand Acid.

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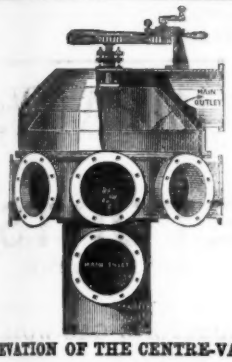
C. & W. WALKERS'
PATENT CENTRE-VALVES.



ELEVATION OF THE CENTRE-VALVE.

PLAN OF THE VALVE.

PLAN OF THE BODY.

These PATENT CENTRE-VALVES are the most perfect and certain means for working Purifiers on the system of three in action, and one out of action. The Valve itself is protected from all injury inside the safety cover. The working of the Valve is so easy, and so governed by the stop-catch movement, that the Purifiers can be instantaneously changed in the dark as well as in daylight. They are scraped perfectly true, metal to metal, the facings heretofore exposed are always covered, and there is nothing more reliable, certain, and durable in a gas-works. By their use the floor of the Purifying-house is clear and level; the Valve and all connexions being beneath the floor, out of the way of working. A considerable improvement and saving is effected in the cost of the connecting-pipes.

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INVITE THE ATTENTION OF GAS COMPANIES AND OTHERS FOR THE SUPPLY OF

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And every description of Gas Machinery.

TENDERS GIVEN FOR WORK FIXED COMPLETE IN ANY PART OF THE KINGDOM.

WEST'S GAS IMPROVEMENT COMPANY,
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ARE NOW PREPARED TO SUPPLY AND ERECT THEIR PATENTED MACHINERY FOR

CHARGING AND DRAWING GAS-RETORTS,
And to enter into arrangements with GAS COMPANIES for its use upon moderate terms of Royalty.

The Patented Machinery has secured the approbation of all Engineers who have visited the MAIDSTONE GAS-WORKS, *where it is in full operation, and may be inspected at any time on application to the Manager.*

The advantages attending its use are—

INCREASED VOLUME OF GAS PER TON.—INCREASED YIELD PER RETORT.—INCREASED BULK OF COKE FOR SALE.—REDUCTION IN LABOUR AND LESS DEPENDENCE ON SKILLED STOKERS.

A Pamphlet containing a description of the Machinery, and Copies of Reports on the working of the same, &c., will be forwarded on application to the MANAGING DIRECTOR, Maidstone. Communications may also be addressed to the Consulting Engineer, R. P. SPICE, Esq., M. Inst. C.E., 21, Parliament Street, London, S.W., or to the Engineer and Analyst, F. W. HARTLEY, Esq., A. Inst. C.E., 55, Millbank Street, London, S.W.

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GAS ENGINEERS, FROME SELWOOD,
MANUFACTURERS OF ALL DESCRIPTIONS OF

APPARATUS CONNECTED WITH GAS-WORKS.
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DRY-FACED VALVES
FOR PURIFIERS, GASHOLDERS, BYE-PASS, AND OTHER ARRANGEMENTS REQUIRING VALVES IN GAS-WORKS.

The Faced Valves, as made by the Patentees, continue to give great satisfaction, and they are being used extensively by many of the best gas engineers of the day.

They are more easily repaired than any other kind of Valve in use, and can be re-ground in a few hours without removal, and made perfectly gas-tight.

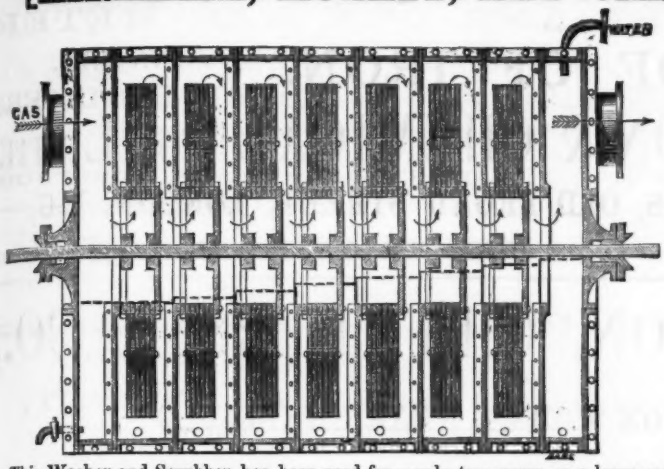
References can be given to many Engineers of high standing, who will testify as to the favour in which they are held.

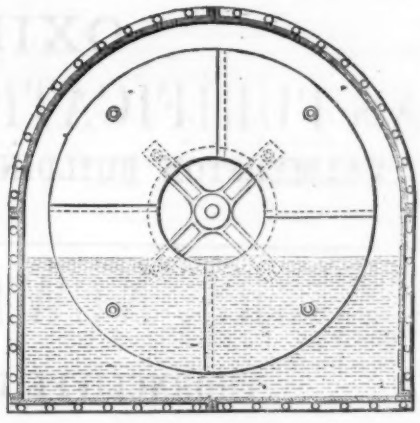
MANUFACTURERS ALSO OF SUPERIOR WOOD GRIDS FOR PURIFIERS, SCRUBBERS, &c.

THE

"STANDARD" WASHER & SCRUBBER.

[KIRKHAM, HULETT, AND CHANDLER'S PATENT.]





This Washer and Scrubber has been used for nearly two years on a large scale at the Works of The Gaslight and Coke Company, Bromley-by-Bow, at which station there are now several in operation and in course of construction. There is also one in use at the Pancras Station, King's Cross, of the same Company, which is purifying 1,500,000 cubic feet of gas per day. At the Gas-Works of the Corporation of Leeds, a large one has been erected, which is giving complete satisfaction. The Special Merits of this Washer are as follows:—

That it is a very effective Condenser, so that it is not absolutely necessary to reduce the temperature of the gas to 60°, or thereabouts, to make the Washer effective. That the distribution of the liquor is made with unerring regularity. That it occupies very small space, so that it can be, at little expense, effectually protected from extreme changes of the weather. That the considerable expense of Coke or Wood, or other Scrubbing Material, is entirely saved, and that the great nuisance and cost of from time to time replacing the Scrubbing Material is avoided. That, by the revolution of the discs, the quantity of water carried up by them, and tending continuously to fall, exposes a very large amount of fresh wetted surface to contact with the gas. That it is particularly adapted for Gas-Works where Sulphate of Ammonia is manufactured. That it is much cheaper than any other Scrubber that will do the same amount of work effectually. That it is the only Washer suitable for purifying Gas from all its impurities by solution. That it works with a minimum of pressure. That it takes out every trace of Ammonia from the Gas in once traversing the machine. That it requires very little outlay for foundations.

The following Testimonials show the opinion of eminent Engineers as to the capabilities of the Washer:—

D. HULETT, Esq. *The Gaslight and Coke Company, Bromley-by-Bow, May 3, 1877.*

Dear Sir,—In answer to your inquiries respecting the results of the working of your Patent Washer, I beg to state that I find it a very efficient machine. I have had it in operation for some time, and passed gas through it continuously at the rate of 100,000 cubic feet per hour, and obtained from it 11 gallons of 10 oz. liquor per ton of coal carbonized—results which appear to me very satisfactory for so small a Washer. It works very smoothly, taking but little power, and giving no pressure. I have it still in operation, and am perfectly satisfied with its working.

I am, dear Sir, yours truly, (Signed) W. B. WRIGHT.

Messrs. KIRKHAM, HULETT, and CHANDLER. *The Leeds Corporation Gas-Works, York Street, Leeds, Dec. 6, 1878.*

Gentlemen,—The Scrubber-Washer erected by you at these works, and which has been in use for six months, has proved to be, so far as we have been able to test it, thoroughly efficient. We are at present making 32,000 feet of gas per hour, and are entirely dependent on this apparatus for the removal of Ammonia, and the **Gas is perfectly free from that impurity in the sixth chamber**, so that four chambers remain to deal with an increasing make of gas. Owing to insufficient condensers, the gas was in the summer admitted to the Scrubber at a temperature of 70°, but was reduced therein to 61°, or that of the atmosphere. The volutes are driven at the rate of four revolutions per minute, and, working at that speed, there is not the slightest difference between the inlet and the outlet pressure. Clean water supplied at the rate of 10 gallons per ton of coal carbonized is converted into liquor of from 10 oz. to 13 oz. strength **in once traversing the vessel.** The apparatus is extremely simple and compact, occupies but little space, and requires no foundation. I shall be surprised if it does not eventually become extremely popular.

I am, Gentlemen, yours faithfully, (Signed) HENRY WOODALL, Engineer.

Messrs. KIRKHAM, HULETT, and CHANDLER. *The Gaslight and Coke Company, York Road, King's Cross, Jan. 14, 1879.*

Gentlemen,—In reply to your inquiry, I am pleased to say, the Washer which was put in action at this station in October last has quite fulfilled my expectations, as it confirms the experiments I made in May last with the smaller machine. Working at four revolutions per minute, **it takes out every particle of Ammonia**, while purifying more Gas than it was intended to do. I enclose particulars of a fortnight's working during our heaviest make, by which you will see that it yields the full quantity and strength of liquor, and works with little pressure. I am therefore quite satisfied with the machine, and trust it may meet with the success it deserves.—I remain, &c. (Signed) JOHN CLARK.

The following Table shows the results of the working of one of these Washers, lately erected to purify 60,000 feet of Gas per Hour, at the St. Pancras Station of The Gaslight and Coke Company:—

1879.	Nos. of the Divisions and Strength of Liquor in each.										Water used per Ton of Coals.	Gas Purified per Hour, Cubic Feet.	Ammonia on Outlet.	Temperature.			Pressures.		Revolutions per Minute.
	1	2	3	4	5	6	7	8	9	10				Inlet.	Outlet.	Atmosphere.	Inlet, Inches.	Outlet, Inches.	
	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.									
January 1	8½	6½	5	3½	2½	1½	¾	¼	0	0	10 Gallons.	52,000	Nil.	77°	73°	48°	24	23	7½
" 2	8¾	7	6	4½	3½	2¼	1½	½	¼	0	10 "	57,000	Nil.	78°	66°	32°	21½	20½	4
" 3	9½	8	6	3½	3	2½	1½	¾	¼	0	10 "	60,000	Nil.	75°	68°	40°	23½	22	4
" 4	9¼	7½	6½	4½	3½	2½	1¼	¾	¼	0	10 "	65,000	Nil.	74°	68°	33°	24	22½	5
" 5	9½	7	6	4	3	2½	1½	1	¼	0	10 "	34,000	Nil.	77°	68°	35°	14½	14	5
" 6	9¼	7½	6½	4½	3	2½	1½	1	¼	0	10 "	63,000	Nil.	72°	66°	27°	24	22½	4½
" 7	11	9	7	5½	3½	3	1¾	1½	¼	0	10 "	59,000	Nil.	74°	66°	31°	25	23½	5
" 8	9½	7½	6	4½	3	2	1	¾	¼	0	10 "	78,000	Nil.	73°	61°	31°	28	26½	4½
" 9	11	9	7	5	3½	2½	1½	1	¼	0	10 "	82,000	Nil.	74°	67°	33°	27½	25½	5
" 10	10¾	8½	6½	5	3½	2½	1½	1	¼	0	10 "	66,000	Nil.	76°	64°	28°	28½	27	5
" 11	12½	10	7½	5½	4½	3½	1¾	1½	¼	0	10 "	61,000	Nil.	73°	64°	27°	26½	25½	5
" 12	11	8½	6½	—	—	—	1½	¾	¼	0	10 "	39,000	Nil.	74°	64°	27°	26½	25½	5
" 13	13	10½	8½	6	4½	3½	2	1½	¼	0	10 "	78,000	Nil.	73°	65°	42°	28	26	5

Messrs. KIRKHAM, HULETT, and CHANDLER. *Corporation of Birmingham, Gas Department, Saltley Works, May 23, 1879.*

Gentlemen,—I beg to enclose you a copy of the results of the tests which, by the kind permission of the Engineer, Mr. Clark, I made on the 6th of March last, of the working of one of your "Standard" Washers and Scrubbers at the St. Pancras Station of The Gaslight and Coke Company, and I am of opinion that, for an apparatus occupying so small a space, they are exceedingly satisfactory.—Yours truly, HENRY HACK, Engineer.

Working Results obtained from KIRKHAM, HULETT, *and* CHANDLER'S *Patent "Standard" Washer and Scrubber at the St. Pancras Station of The Gaslight and Coke Company, London, March 6, 1879.*

Gas passing per Hour, Cubic Feet.	—	Impurities in Gas per 100 Cubic Feet.			Temperature.		Pressure in Inches.	Revolution of Apparatus per Minute.	—	No. of Divisions and Strength of Liquor.										Water Used during Experiment. Gallons.
		SH_2	CO_2.	Grains. NH_3.	Washer.	Air.				—	—	—	—	—	—	—	—	—	—	
64,000	Inlet	2·00	2·00	158·8	72	57	21	4½	Twaddel deg. at 60°	5·3	4·9	2·85	2·35	1·7	1·05	0·6	0·3	0·15	0·1	62
	Outlet	1·50	1·50	0·8	68	57	20		Acid, ounces.	11·0	8·4	6·3	4·5	2·7	1·7	1·3	0·7	0·3	—	

WASHER-SCRUBBERS OF THIS PATENT ARE IN COURSE OF CONSTRUCTION FOR BECKTON, BRADFORD, GREENWICH, WOOLWICH, AND SEVERAL OTHER GAS-WORKS.

For further particulars and testimonials, address

Messrs. KIRKHAM & HERSEY, GAS ENGINEERS, 21, ABINGDON STREET, WESTMINSTER.

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WOOD PURIFIER SIEVES,

Which have now been used for fifteen years, and their advantages and durability fully established. They are made entirely by steam machinery in very large quantities at the most moderate cost.

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FINSBURY CIRCUS, LONDON.

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Also Makers of all kinds of Common Building Bricks, and of Pressed White and Red Bricks for Facing.

ESTABLISHED IN 1860.
BENJAMIN CARPENTER,
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Are the Sole Manufacturers of
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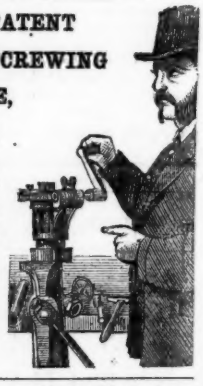
ALSO OF
Archer's Patent Stone Breaker,
AND OF
Archer's Patent Ore Crusher & Pulveriser,
The last-named Machine (without the Pulveriser) makes the best and most durable Coke Breaker.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
WENLOCK IRON WHARF, 21 & 22, WHARF ROAD, CITY ROAD, LONDON, N.,
Manufacture and keep in stock at their works (also a large stock in London) PIPES and CONNECTIONS 1½ to 48 inches in diameter; and make to order Retorts, Purifiers, and Tanks, with or without planed joints, Columns, Girders, Special Castings, required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE.—Syphons and Covers are joint-faced if required, doing away with millboard and iron boring, or Syphons made without Covers, a socket being cast on and fitted with a small plug about 6 inches in diameter with lead joint. In either way preventing leakage.

GRIRDROD'S PATENT
PORTABLE PIPE SCREWING MACHINE,



For 1 in., 1¼ in., 1½ in., and 2 in. Gas Threads, complete £7 10s.
In use at the chief gas-works, and giving great satisfaction.
For other useful goods, see Bailey's "Illustrated Inventions," post free 3s. 6d.; gratis to ledger customers.

W. H. BAILEY & CO.,
Brassfounders, Gauge Injector and Tool Makers,
ALBION WORKS, SALFORD,
LANCASHIRE.

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SHEAF AND SPRING WORKS,
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MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS,
STEEL OF ALL DESCRIPTIONS,
SCREW STOCKS, TAPS, AND DIES, SPANNERS,
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ATLAS METER-WORKS, OLDHAM,
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LAMP-METERS IN CAST-IRON BOXES,
And every Description of Gas Apparatus.

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STATION-METERS GOVERNORS, CONSUMERS METERS, GAS LUSTRES, CHANDELIERS, BRACKETS, &c.,
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These Regulators are made in various forms, adjusted to pass from One-half to Sixty cubic feet per hour.

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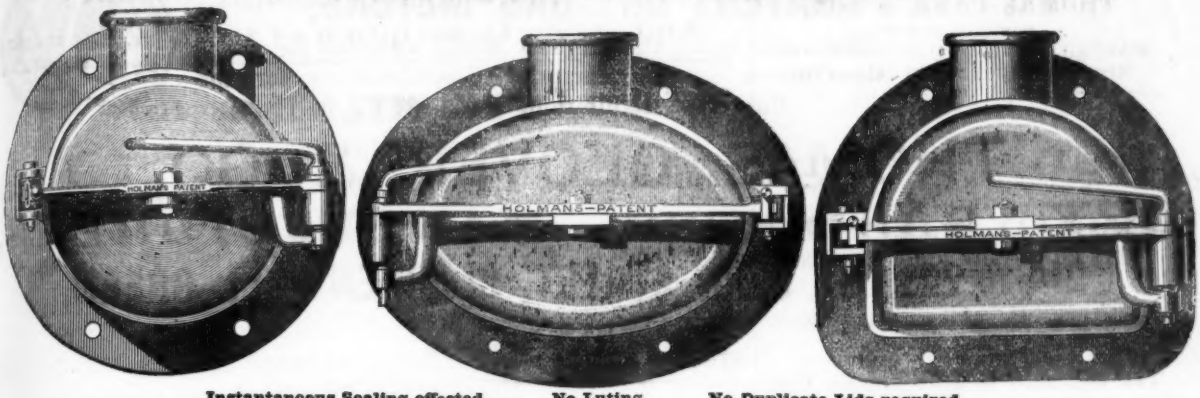
(LATE OF 10, LAURENCE POUNTNEY LANE.)

SOLE MAKERS OF MORTON'S PATENT SELF-SEALING RETORT-LIDS,

WITH HOLMAN'S PATENT ECCENTRIC FASTENINGS,

Anti-Friction Catches, and New Self-Adjusting Cross-Bars.



Instantaneous Sealing effected. No Luting. No Duplicate Lids required.

Holman's New Self-Sustaining Cross-Bar ensures freedom of Joint, and maintains parallel position of the Lids.

Since their introduction in 1869, these Patent Retort-Lids have been thoroughly tested, being now in use in nearly all the principal Gas-Works in London and the Provinces.

T. B. and H. are now making the "Morton's Self-Sealing Lid" of the SAME FORM OR SECTION AS THE RETORT (see Illustrations above), as well as bringing the Mouthpiece from the D or Oval at back to Circular in front, as heretofore.

D and Oval Morton's Lids are working satisfactorily both in this country, on the Continent, and in the United States of America. Among others they have been adopted by the following Gas-Works:—

The Gaslight Company's Works, Fulham; Ditto, Bromley-by-Bow; Ditto, King's Cross; Ditto, Shoreditch.
And also in the Gas-Works at Richmond, Maidstone, Gloucester, Glasgow, Portsea, Roubaix (France), The Hague (Holland).

HUNT'S PATENT EQUILIBRIUM GAS-GOVERNOR.

In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown in the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

The principal advantages of this arrangement over the ordinary form of Governor are as follows:—

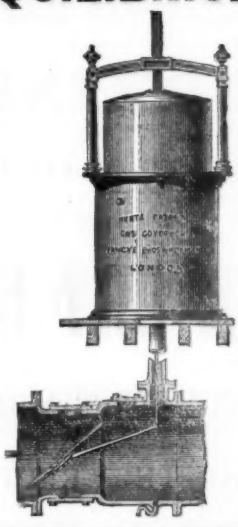
Its sensitive action prevents oscillation.

It is self-adjusting—*i.e.*, it maintains a steady pressure under variations of inlet pressure or a fluctuating consumption.

The inlet to Gasholder being contracted to the smallest possible dimensions, all danger from leakage through insufficiency of seal, tilting, &c., is entirely avoided.

The valve portion being separate from the holder, it can be handled and fixed like an ordinary Slide-Valve direct in the main; and the holder can be placed at an convenient distance immediately above it. The cost is thus materially reduced, and the inconvenience of heavy lifts done away with.

There are no working parts likely to get out of order.



These Governors have been adopted by many leading Gas Companies, among whom are the following:—

The Gaslight and Coke Co. (9), The London Gas Co. (3), and at Abergavenny, Arundel, Birmingham, Cannes (France), Devonport, Dursley, Exeter, Guernsey, Halesowen, Mentone (France), Monmouth, Newcastle-on-Tyne, Oxford, Plymouth, Rochdale, Windsor, &c.

TESTIMONIAL.

The Gaslight and Coke Company,
9, Water Street, New Bridge Street,
Blackfriars, E.C., Feb. 27, 1875.

MESSRS. TANGYE BROTHERS AND HOLMAN.

Gentlemen,—The two 24-inch and three 36-inch Hunt's Equilibrium Governors supplied by you, and fixed in the valve-rooms at Whitechapel, Goswell Road, and Blackfriars, are working very satisfactorily.

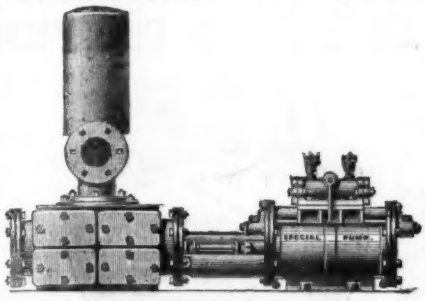
Yours truly,

(Signed) JOHN JOHNSON.

PRICES AND FULL PARTICULARS ON APPLICATION

THE "SPECIAL" STEAM-PUMP.

Diameter of Steam Cylinder.	Diameter of Water Cylinder.	Length of Stroke.	Gallons of Water per Hour, Approximate.	Reduced Prices.
3	1½	9	450	£16
4	2	9	815	18
5*	2½	12	1,250*	21
5*	3	12	1,830*	22 10
4	4	12	3,250	25
6*	4	12	3,250*	30
5	5	12	5,070	32 10
7*	5	12	5,070*	40
6	6	12	7,330	40
8*	6	12	7,330*	50
7	7	12	9,750	50
10*	7	12	9,750*	65



In use in a Hundred Gas-Works in the United Kingdom for Pumping Ammoniacal Liquor, Water, or Tar.

Messrs. Burt, Boulton, and Haywood, Manufacturing Chemists, have over FORTY "Special" Steam-Pumps in use at their several large Tar-Works.

Two Hundred Sizes made. Those in Table opposite are the leading Sizes for use in Gas-Works and Chemical Works.

* These Sizes being usually selected for pumping Tar and Liquor, are always in stock, or nearly ready, fitted with all pump details in iron, and extra length distance-piece between steam and pump cylinder, at a small extra cost.

TANGYE'S HIGH-PRESSURE AND CONDENSING STEAM-ENGINES; CORNISH, VERTICAL, & TUBULAR BOILERS; HYDRAULIC AND SCREW LIFTING-JACKS, CRABS, PULLEY-BLOCKS, &c.

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London, 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865. Paris, 1867.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters bv the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

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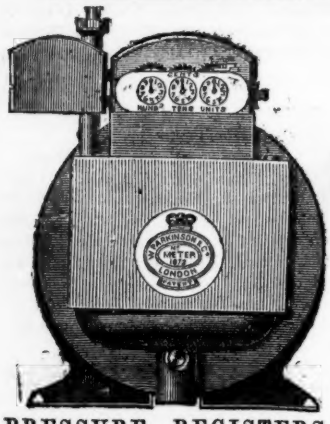
THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS.

1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

WILLIAM PARKINSON AND CO.,



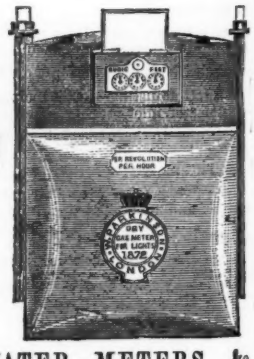
(ESTABLISHED 1816,)

MANUFACTURERS OF

WET & DRY METERS,

STATION-METERS & GOVERNORS,

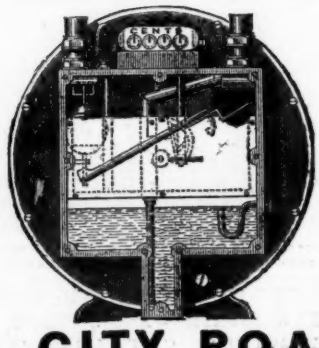
EXHAUSTER REGULATORS,



PRESSURE REGISTERS, EXPERIMENTAL APPARATUS, GAUGES, WATER-METERS, &c.

HUNT'S PATENT IMPROVED COMPENSATING METER.

In this Meter, the action of the measuring-drum is reversed. By this arrangement an improvement is effected in the registration at high speeds, which, in many tests, has not varied from the smallest light to three times the capacity of the meter. It works equally well under all pressures. The range of error between the high and low line is much smaller than that allowed by the "Sale of Gas Act."



The Meter has been critically tested, and most favourably reported upon by official Meter Inspectors in London and Birmingham.

W. PARKINSON and CO. have made arrangements for the manufacture of these Meters, both in tin and cast-iron cases, and for the alteration of old ones to this principle, which is confidently recommended as possessing every quality that can be desired by Gas Companies, Corporations, or Private Consumers.

COTTAGE LANE, CITY ROAD, LONDON, E.C.

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TO CORRESPONDENTS.

W. L., A. J. D., C. C. S.—*Thanks for letters received. See below.*
R. B.—*Too late for notice this week.*
S. N. C. T.—*Pamphlet received, and shall have attention.*

THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, NOVEMBER 18, 1879.

Circular to Gas Companies.

We may commence the "Circular" to-day by correcting a statement made last week, when referring to the extraordinary meeting of the Bristol United Gas Company, recently held. We stated that the Companies Clauses Act, 1863, only allows four per cent. interest to be paid on debentures, overlooking the fact that the Amendment Act of 1869 removes this restriction, and enacts that—"Part III. of the "Companies Clauses Act, 1863, shall be read and have effect "as if the following words, that is to say, 'not exceeding the "'rate prescribed in the Special Act, and if no rate is pre-"'scribed then not exceeding the rate of four pounds per "'centum per annum,' had not been inserted in section 22 of "that Act; and any Special Act of a Company passed before "the passing of this Act prescribing any rate, shall be read "and have effect as if no rate had been prescribed therein." The rate of interest, therefore, is at the discretion of the Directors, unless a rate be prescribed in the Special Act.

The daily papers of last Saturday contained the first batch of parliamentary notices of measures to be promoted in next session of Parliament. The first we may comment upon is that put forward by the Corporation of the City of London. The co-operation of the Metropolitan Board was invited, but that body, at their meeting last Friday, declined to join in the enterprise, and we now do not know what will become of the projected Bill, the object of which is to alter and amend certain clauses in the Acts of The Gaslight and Coke, the Commercial, and the South Metropolitan Gas Companies. The alterations proposed to be made mainly relate to the forfeitures and penalties that may be incurred for defects in illuminating power, purity, and pressure; but there is, at the same time, notice given of an intention, if possible, to alter the illuminating power, of course in an upward direction. We do not think we need say more on this matter, for since the Metropolitan Board, who are alone concerned with the Commercial and South Metropolitan Companies, decline to join in promoting the Bill, it will probably be dropped. The Corporation of the City of London are interested in The Gaslight and Coke Company only, and they have accordingly, on their own account, given notice of a Bill to alter and amend certain clauses in the Company's Acts relating to testing and testing-stations, and to make further and more effectual provision as to testing the purity, pressure, and illuminating power of the gas supplied within the City, also as to the position and number of the testing-places. It is, of course, desired to alter the present mode of assessing forfeitures and penalties, and to impose new ones. The notice also proposes to give further powers to the Gas Referees.

It has been known for some time that the Phœnix Company have it in their minds to erect extensive works not exactly in rivalry of those at Beckton, but still on a large scale, nearly opposite that station, on the Kentish side of the river. They give notice of a Bill to acquire for their purpose eighty-six acres of land on which to erect manufacturing and storeage works, and for the conversion of residual products. The Bill will further be to empower the Company to raise additional capital. The Company will necessarily go in for the sliding scale, and, we presume, auction clauses. It is further desired to manufacture and supply apparatus for the use of gas for other than illuminating purposes, and to supply ordinary gas-fittings. General powers of amalgamation with all Companies within the Metropolitan district are also desired. This is significant, and makes us hope that before many years are over a general amalgamation may take place. The notice states that there is, as our readers have already been informed, a scheme before the Board of Trade for the amalgamation of the Phœnix with the South Metropolitan Company; and in the event of its being confirmed, this measure will be proceeded with by the United Company.

Perhaps, under the circumstances, it was necessary for the South Metropolitan Company to give a notice similar to the above. Accordingly, we find this Company announcing their intention of acquiring the same lands as will be scheduled by the Phœnix Company, and for the same purposes. New capital will be asked for in their Bill, and this is to be raised by the creation of new stock, and by borrowing on mortgage or bonds. As a matter of course, the standard illuminating power of the gas to be supplied by the United Company will be brought up to that of the South Metropolitan Company; but it is only fair to say that the Phœnix Company, though legally bound to supply only twelve-candle gas, have for years past supplied gas equal, or nearly equal in power and purity to that furnished by the South Metropolitan Company. We look for the happiest results from the combination of the Southern Companies which is foreshadowed in these notices, and in the scheme now before the Board of Trade. The consumers in the Phœnix district must in any case be considerably benefited, and the conjoined Companies will, we feel satisfied, enjoy a long course of prosperity.

The London Gas Company give notice of a Bill very similar to that which they promoted but withdrew last session, to give them power to supply gas-fittings, engines, stoves, and other appliances for lighting, warming, ventilating, cooking, experiments in lighting, and for other purposes. We hope the Company will succeed in obtaining the powers they desire, which cannot but be equally beneficial to them and to their consumers.

From the abstracts, in another column, of the Gas Acts passed last session to confer further powers upon Companies already incorporated, it will be seen that gas legislation, as we have already said, has taken an almost stereotyped form. The peculiar feature of the Alliance and Dublin Company's Act is the power to supply in bulk different qualities of gas for any purpose. We can hardly guess what the Company intend to do. To supply gas of different qualities for special purposes would involve a considerable alteration of plant; and we do not exactly see how the Company are to be

benefited by the business. We presume, from the use of the word "transit," that the Company are going in for lighting railway carriages, and, perhaps, intend to work Pintsch's process.

The Crystal Palace District Gas Company succeeded in carrying just such a Bill as the London Company desire to have passed in the coming session. They have acquired power to manufacture, purchase, sell, and let on hire all kinds of fittings and appliances for the use of gas; but it is stipulated that they shall keep a separate account of this branch of their business, and not more than five per cent. of their capital for the time being is to be employed in it.

Of the other twelve Acts which now come under our purview, it will be seen that six have only auction clauses imposed, and that the rest have both auction clauses and sliding scale prescribed. As regards the initial prices granted, we may remark that Parliament has been rather liberal, except in the case of the Plymouth and Stonehouse Gas Company, who certainly should, we consider, have been allowed a higher figure than 2s. 6d. per thousand feet. This well-managed Company, however, are certain to succeed in reducing their price, and in paying larger dividends than at present. The Newcastle and Gateshead Company have a sort of double standard. They may charge up to 3s. 4d., but the sliding scale will not come into operation until gas is sold at less than 2s. 9d. per thousand feet. There is something peculiar about one provision in the Preston Gas Act, which empowers the Company to raise £120,000, which, as we read it, is to include premiums realized by the sale by auction or tender. When new capital is issued, it will require a little nice calculation to estimate the amount of premiums expected to be realized, so as to conform with this provision. A similar provision to this occurs in the Newcastle Gas Act. There is another clause in the Preston Gas Act which deserves notice, and that is the one which is intended to compel the Company to exercise their borrowing powers to the fullest extent. They must, in fact, borrow to the full amount in respect of the capital issued at any time before any further amount of capital can be raised.

By an Act passed in the last session, to which we shall have to refer in a subsequent number, the Corporation of Over Darwen extended their limits so as to include a certain portion of Lower Darwen and Eccleshill, which had up to that time been supplied with gas by the Corporation of Blackburn. It was, of course, arranged that the gas plant of the latter Corporation lying within the limits should be paid for, the price to be settled by arbitration. The Arbitrator fixed the sum of £12,626 6s., which was to include the value of all pipes, apparatus, plant, machinery, property, and works. It will be seen that meters were not specifically mentioned here; but, from the statement of the Mayor of Over Darwen at the last meeting of the Council, it is clear that the value of these was included in the bargain. The purchase-money was duly paid to date; but apparently under the impression that meters were not included in the sale, the officers of the Blackburn Corporation sent a number of men to forcibly remove the meters from the houses of their *quondam* consumers. This action nearly gave rise to a riot, but the Blackburn men succeeded in carrying off 171 meters. The proceeding, which began on Saturday week, and was completed on the following Monday, created a great deal of excitement; but by this time the Corporation of Over Darwen were fairly roused, and many communications took place between them and the Corporation of Blackburn, which, to cut a long story short, ended in the confession that the proceedings of the latter were unjustifiable and illegal. There was no other course open to them than to admit their liability for all damage done, and to pay for 171 new meters to replace those forcibly taken away. But their liability does not end here. Lower Darwen was without gas for some days, which, of course, constituted considerable pecuniary loss to the Corporation of Over Darwen. For this, too, Blackburn must pay, together with compensation for gas consumed, but the amount of which was not ascertained by the Over Darwen Corporation. The whole estimate of the total damage claimed by Over Darwen—apart from the cost of meters, which comes to £260—amounts to £300. All the money claimed by Over Darwen will be cheerfully paid by Blackburn, and an ample apology for the illegal proceedings has been rendered, and, of course, accepted.

We referred some time ago to the disagreements between the Stretford Gas Company and their consumers. By their Act of Incorporation, passed in 1862, the Company obtained power to raise £39,000. By a subsequent Act, passed in 1877, power was granted to raise additional capital to the amount of £61,000, both sums carrying the usual borrowing powers. It was enacted that the capital last mentioned should be sold by auction or tender; but nothing was said about the application of premiums, which, of course, under the circumstances, were transferred to profit and loss account. By the Act of 1862 it was only necessary for the Company to file such accounts as were sent to the Shareholders; but, by their Act of 1877, the Gas-Works Clauses Act, 1871, was incorporated, and they now consequently publish their accounts in the form required by the Board of Trade. It is nothing to the discredit of the Company that from 1872 to 1877 they furnished none but the meagre accounts we have mentioned. It seems that since the passing of their Act of 1877 they have strictly complied with its obligations, and made out their accounts in due form. There is, however, in Stretford, a Gas Consumers Vigilance Committee, who carefully watch the proceedings of the Company, anxious, if they can, to find some point on which to base a charge of illegal conduct on the part of the Company. One thing is particularly fixed upon—namely, the payment of a bonus of twenty per cent. to the old Shareholders in 1877. The Vigilance Committee do not seem to understand that this is simply the payment of back dividends to Shareholders who probably for years had received little or nothing. As to the transference of £3500 to the reserve-fund, that was a perfectly legal mode of disposing of profits in excess of those required for the payment of the statutory dividends. The formation of a depreciation-fund is also perfectly legal, and the disposition of the money accumulated is at the Company's option. In all we find reported to have been done, we do not see that any charge of having acted illegally can be brought against the Company. On the contrary, it seems to us that some liberality has been shown. The price which the Company were allowed to charge by their Act of 1862 was 5s. per thousand feet, which price was not altered in the Act of 1877; but, as a matter of fact, the Company had brought down the charge to 3s. 9d., and this is now reduced to 3s. 6d., showing that the Company are by no means regardless of the consumers interests. Vigilance Committees, so far as we have had any experience of them in gas matters, only foment strife, and never do the smallest good.

The electric light at the British Museum does not seem to give unmitigated satisfaction. Our contemporary, the *World*, describes it as wanting in everything that would make it an agreeable and effective light. The writer of the paragraph reprinted in another column evidently does not understand the use of the hand-lamps on which he comments. The attendants who fetch books for readers have to walk along dark and narrow passages to find the books they are in search of, and require the aid of these lights. We may mention here that a well-known scientific man, Mr. Lant Carpenter, has recently been to the United States, where he interviewed Mr. Edison. He gives it as his opinion that that gentleman is no nearer the subdivision of the electric light now than he was two years ago, and that it will be a very long time before the light can be adapted for domestic illumination, even if it ever can be.

The exhibition of gas apparatus promoted by the Corporation of Nottingham will, as may be seen from an advertisement in another column, be opened next Monday. The exhibits will embrace all appliances for the use of gas, whether for lighting, heating, or cooking purposes, and also for the production of mechanical force. The collection promises to be very complete, and will doubtless attract large attendances of visitors. The Paisley Corporation also design to hold a similar exhibition, to be opened on the 15th of December. It will include all such exhibits as are specified above; and communications on the subject are desired by Mr. Hislop, the Engineer and Manager of the gas-works, from all willing to take part in the proceedings.

Rustless Iron.—Mr. G. Bower, of St. Neots, has received two medals for his air process of preserving iron from rust—one from the Royal Cornwall Polytechnic Society, and the other from the Yorkshire Fine Art and Industrial Exhibition.

The Gas and Water Supply of Ipswich.—At the annual meeting of the Ipswich Town Council on Monday, the 10th inst., a report was presented from the Paving and Lighting Committee, embodying a report of a Sub-Committee, to whom they had referred the question of the advisability of purchasing the gas and water works, and which report the Committee had adopted. The Sub-Committee stated that they had obtained from Mr. G. W. Stevenson, C.E., a report as to the water-works, concerning the purchase of which they say that they could not obtain from the Company an offer of the works at a less sum than an advance of £20,000 in excess of the sum at which the Company would have sold at the time of the negotiations in 1874. They would, however, have been prepared, under Mr. Stevenson's advice, to recommend the purchase at a sum in advance of the sum previously agreed to be accepted by the Company; but the Company withdrew their offer on Oct. 31, 1878, and the Committee now recommended that further negotiation be discontinued. As to purchasing the gas-works, they consider, having regard to the probable future development of electric and other modes of lighting, no further negotiations should be attempted for the purchase of these works.

Water and Sanitary Notes.

At last there has been found an independent party who have a plan for taking over the undertakings of the Metropolitan Water Companies. Mr. Beal and Mr. Watherston are, no doubt, at the bottom of the notice which has been published, of a Bill to be introduced in the next session of Parliament in reference to the Water Supply of London, and which probably refers to the scheme that the latter gentleman said would be revealed at the proper time. The proposal is to constitute a Metropolitan Water Trust, who are to make a compulsory purchase of the London Water Companies works, and afterwards manage them for the benefit of the public. The Trust, we presume, will be a sort of imitation of the Edinburgh Water Trust. We do not think we need give any further account of this notice, for in all likelihood the Bill it foreshadows will never see the table of either House of Parliament.

We may say here that Cardinal Manning and his party are still hard at work in endeavouring to bring about an alteration in the management of the London Water Companies, and the whole supply. It may be that the Cardinal's party will adopt the Bill above referred to; but, if so, it is of little consequence, for nothing can be done without Government aid, and Mr. Cross will have something to say on the matter, and dictate the scheme which he thinks will be best for the Metropolis.

It has always occurred to us that everything complained of in the Metropolitan Water Supply might easily be remedied if the Companies would but amalgamate, and bring the whole of the supply under a constant system with some increased pressure. No one, however, seemed to suppose until now that it would be possible to unite the Companies except under the compulsion of Government. But a bright thought has struck the Southwark and Vauxhall Company, who have given notice of a Bill to, among other things, effect the amalgamation we have so long advocated, though it was never our wish to see the undertakings combined under the *ægis* of one Company. Our desire was to see them all voluntarily united of their own accord. In that way, we believe, might have been brought about a much happier state of things than would result from that which is foreshadowed in the above-mentioned notice. The Southwark and Vauxhall Company intend to introduce a Bill to raise additional capital, and acquire more land for the purposes of their undertaking. If, however, the Government decide on dealing with the Metropolitan Water Question as a whole, the affairs of individual Companies must remain in abeyance.

An old idea has been revived—namely, to bring sea water from the south coast to the Metropolis. The point of intake now selected is Lancing, in Sussex, which is, perhaps, the watering-place nearest to London. The proposal is to supply sea water to the towns and villages through which the aqueduct is to pass between Lancing and Fulham, where it will terminate. From this point the sea water may be conveyed on to Richmond and Barnes, and then be brought to London and distributed in Kensington; St. George's, Hanover Square; St. Anne's, Soho; and generally all over the western district of the Metropolis, to which alone it is proposed to furnish that health-restoring fluid—sea water. The scheme is, no doubt, feasible, but where is the money to come from to bring it into operation?

The Liverpool Corporation give notice of a Bill to carry out their Vyrnwy water supply scheme. It is a very comprehensive measure, and we sincerely hope the notices are complete, so that there may be no failure upon Standing Orders. It is unnecessary to say that the projected works are of a very extensive character, comprising two enormous reservoirs, and necessarily long lines of aqueducts. Speaking generally, we may say that it is proposed to fully protect all interests, the Fisheries being particularly looked after. So much stress has been laid on this point, that the care the Corporation have taken will, no doubt, disarm a great deal of opposition. The notice states it will be proposed by the Bill to authorize the Corporation to supply water to other Authorities within or without their limits. Oswestry, in which parish a large reservoir will be situated, ask for a supply, and it will no doubt be granted. We may once more express an earnest hope that this measure will be triumphantly carried through Parliament. No doubt a great deal of opposition will be raised; but most likely the Corporation will be able to satisfy their opponents that their interests will not be interfered with, but in some cases promoted.

A portion of the inhabitants of Edinburgh do not appear to be at all satisfied with the new water supply which the Water Trust have furnished to them, and would have preferred an additional supply from the Pentland Hills, which, we believe, could not have been obtained. The new supply, even after it has been submitted to what we must call inadequate filtration, is, in colour and flavour, so objectionable that it satisfies the public only after it has been mixed with water from the Pentlands. We notice that the Trust will be in Parliament again next year for power to raise further moneys. It must, we think, be admitted that the business of the Trust has been carried on at a most extravagant cost. If the Water Trust which it is proposed to constitute to manage the water affairs of the Metropolis proceed in the same manner, they will soon bring about their ears protests from the ratepayers. In Edinburgh, however, it would appear that "money is of no consequence."

The Lower Thames Valley Main Sewerage Board have given notice of their intention to apply to the Local Government Board for a Provisional Order to obtain all necessary powers to enable them, we imagine, to carry out in full detail the scheme proposed by Lieut.-Col. Haywood, C.E. We fear that the scheme, in whatever form presented, will have to encounter severe opposition. Before the Order is granted the Local Government Board will, no doubt, institute an inquiry, which may possibly result in the sanction of the scheme so far as they are concerned; but then it will have to go before Parliament for confirmation, and there, we believe, the real troubles will commence. The influential parties who last session succeeded in throwing out, on its second reading, the Bill to sanction the scheme, will, doubtless, again appear in opposition; and, if they do, we may be tolerably certain of what the result will be. It seems to many of the genteel inhabitants of the district a monstrous proposition to place a sewage farm in close proximity to valuable residential property, and the proprietors of Sandown Park Estate are equally determined that no sewage odours shall come "between the wind and their "nobility." Thus all is prepared for influential opposition to the designs of the Board, some members of which are resigning their seats for the reason that they cannot assist in carrying out what one retiring member describes as the most costly and least efficient of any of the many schemes that have been laid before them.

We are happy to see that Dr. Frankland reports somewhat more favourably of the water supplied by the Thames Companies during the month of October. They were all, he says, efficiently filtered before delivery, and that of one Company—the West Middlesex—is said to have been equal to the best water supplied from the Lea. In this report we find no mention of "living and moving organisms;" so that we must conclude that efficient filtration removes these bodies, which some consider so objectionable. The New River water is reported to have contained slimy particles of carbonate of lime, which no one could discover who did not allow a considerable bulk of water to deposit, and then examined the sediment with a microscope. Organic matter, of course, most prevailed in the water of the Thames Companies, and that of the Southwark and Vauxhall Company would appear to have contained the most. But Dr. Frankland's fanciful mode of reporting on this matter defies quotation, and we can only refer our readers who interest themselves in the matter to his report, which will be found in another column.

The Stockton and Middlesbrough Water Board are moving in the matter of compelling the exclusion of pollution from the River Tees. A Committee first visited the lead-washing operations at Middleton-in-Teesdale, and came to the singular conclusion that while the lead-washings, or "hush," was injurious to the Fisheries, it was not detrimental to the health of the human beings who drank the water. We should have been glad to have had an analysis of the water now supplied to Stockton and Middlesbrough, for it must be known that lead imbibed in infinitesimal quantities seriously affects health. Lead is a cumulative poison, which sooner or later shows its effects on the constitutions of those who take it. The Board have gone farther, and are about to prevent the admission of sewage into the Tees. But these mere palliative measures will never succeed. The Board must eventually go to a new source for a supply of drinking water. Tees water will do for manufacturing purposes, but for use in a house it is simply an abomination.

An agitation is being raised against the Sheffield Water Company, in consequence of the alleged pollution of one of their dams. The Crookesmoor dam is situated in a district which is rapidly being built over, and is, for the most part, sewered. Unfortunately, the Local Authority who made the sewer have carried it along close to the edge of the dam, and the conclusion is immediately jumped to that infiltration of the sewage into the reservoir must of necessity take place. On the contrary, analyses go to prove that nothing of the sort

happens. It may be well, however, for the Water Company to consider whether or not it is advisable to have an uncovered reservoir in a situation which some believe will soon be the middle of the town. It seems to be admitted that such pollution as is found in the water of the dam comes rather from the atmosphere than the sewer, and this is very probably the fact. At all events, we are certain that whenever good cause is shown for it, the Water Company will take steps to remove all sources of complaint. The Mayor of Sheffield recently called a meeting of the medical men of the town, who agreed that uncovered reservoirs should not be placed in densely crowded localities, and also that the purity of the water supply should not be made to depend on the integrity of the sewers.

Sewage farming at Wolverhampton does not seem to have been a greater success than farming in general during the past season. Light crops have been grown, and as a rule much straw has been obtained, but very little grain. The wheat crops were especially light, and twenty-two acres out of the forty sown with wheat failed almost entirely, from having been irrigated with acid sewage. Barley and oats also produced more straw than grain, and the roots were small. Nevertheless the Corporation, under the circumstances, seem fairly well satisfied with the results, but are very properly bent upon compelling the manufacturers to neutralize their acid liquids before they are allowed to pass into the sewers. The health of Wolverhampton keeps good, and the pan system seems to be a success.

GAS LEGISLATION FOR 1879.

(*Continued from p.* 736.)

The fifteen Acts conferring further powers upon Companies already incorporated by statute are as under:—

The *Alliance and Dublin Consumers Gas Act* authorizes the Company to lay down lines of tramways for conveying their coal from Sir John Rogerson's Quay to the works. These tramways are to be laid down under what we may call the superintendence of the Board of Trade, who are to approve of the form of rail. Minute directions are given as to the construction of the lines, which are to run on a level with the road, and the gauge of the rails is not to exceed 3 ft. 1 in. The Act further gives the Company power to manufacture special kinds of gas, to be supplied in bulk or otherwise, for any special trade, transit, business, manufacture, process, or experiment, the remuneration for which is to be fixed by agreement. The Act also empowers the Company to manufacture, purchase, hire, let, and sell meters, stoves, gas-fittings, engines, and all apparatus for the use of gas for other than illuminating purposes. No further capital was asked for in the Bill. The Act very properly gives the Meter Inspectors appointed by the Town Council power to test not merely the drums, but also the registering apparatus of meters.

The *Brighton and Hove Gas Act* is to empower the Brighton and Hove Gas Company to construct additional works, mainly sea defences; but they are at the same time empowered to extend their present works. For these purposes they are authorized to raise £150,000 additional capital, carrying the usual borrowing powers. The new shares are, of course, to be offered by auction or tender, but not more than £25,000 can be raised in any one year. The premiums that may be realized on the shares are not to bear interest, but to be applied as usual in improving the works or paying off the mortgage debt. Gas of fourteen-candle illuminating power is to be supplied, tested by Sugg's "London" Argand burner, No. 1, a certified model of which is to be deposited with the Hove Commissioners. The gas is to be supplied at the usual day and night pressures. The Hove Commissioners obtained power to appoint an Auditor to examine the accounts of the Company. We briefly mention here, that in this and in all other Acts, it is prescribed that the Company shall pay interest at the rate of five per cent. per annum on deposits of more than ten shillings.

The *Bromley Gas Act* authorizes the Bromley Gas Consumers Company, who were incorporated in 1865 with a share capital of £70,000, and borrowing power to the extent of £17,500, all of which capital has been raised and expended, to raise additional capital to the amount of £100,000, with corresponding borrowing powers. The new shares are, of course, to be sold by auction or tender, with the usual restrictions. The dividends on the original capital, subject to the sliding scale, are as follows:—For the first £50,000, ten per cent.; for the remaining £20,000, seven per cent. The dividends on the new capital, also subject to the sliding scale, are limited to seven or six per cent., according as it is issued as ordinary or preference. The initial price for gas is 4s. 6d. per thousand cubic feet. The gas to be supplied is to be equal in illuminating power to the light of fourteen sperm candles, tested by Sugg's "London" Argand burner, No. 1. The usual day and night pressures are also imposed.

The *Bury St. Edmund's Gas Act* is to confer further powers upon the Bury St. Edmund's Gas Company, who were incorporated in 1849 with a share capital of £12,000, and borrowing powers to the extent of £4000. In 1859 the Company obtained power to raise a further sum of £18,000, and to borrow £5000, all of which has been raised and expended. By the present Act the Company are authorized to raise an additional £20,000, carrying the usual borrowing powers. The new shares are to be offered by auction or tender, and premiums are to be applied as usual. Subject to the sliding scale, the initial price is to be 4s. 6d. per thousand feet. The dividends on the additional capital, irrespective of the sliding scale, are limited to seven or six per cent., according as it is issued. The gas to be furnished is to have the illuminating power of fourteen candles, tested by Sugg's "London" Argand burner, No. 1. A testing-station is to be erected upon the works within six months after the passing of the Act. The usual day and night pressures are imposed.

The *Crystal Palace District Gas Act* authorizes the Crystal Palace District Gas Company to supply all kinds of apparatus and fittings for the consumption of gas for any purpose whatever. The Company are to keep separate accounts of their dealings in these articles, and the capital for this branch of their business is not to exceed five per cent. of the paid-up capital of the Company for the time being.

The *Glossop Gas Act* authorizes the Glossop Gas Company to extend their limits, and raise further capital. The Company were incorporated in 1845 with a share capital of £6000, and borrowing powers to the extent of £4000. By an Act passed in 1855, the Company acquired power to raise additional capital to the amount of £18,000, and to borrow £3000, all of which capital and borrowed money has been raised and expended, with the exception of £1800. By this Act the Company obtain authority to raise further capital to the extent of £30,000, carrying the ordinary borrowing powers. The new shares are, of course, to be sold by auction or tender, and the premiums applied as usual. The dividends upon the additional capital are limited to seven or six per cent., according as it is raised as ordinary or preference. The sliding scale is not imposed, but it is prescribed that gas of fifteen-candle power shall be supplied, at a maximum price of 5s. per thousand feet, at the commencement of the new year. The gas is to be tested by Sugg's "London" Argand burner, No. 1, and the present testing-station is to be retained.

The *Ilkley Gas Act* empowers the Ilkley Gas Company to raise additional capital. The Company were incorporated in 1869, with an original share capital of £2100. The Act of Incorporation gave them power to raise additional capital to the amount of £10,000, and to borrow on mortgage the sum of £500 in respect of the original capital, and £2500 in respect of the additional. The present share capital of the Company is £12,100, in £10 shares, which are fully paid up. The dividends payable upon this capital are, for the original sum of £2100, ten per cent., and for the additional capital of £10,000, seven per cent. By this Act the Company acquire power to raise additional capital to the extent of £25,000, carrying the usual borrowing powers. Auction clauses and the sliding scale are imposed, the initial price being fixed at 4s. per thousand feet. Any premiums realized by the sale of shares by auction are to be applied, as usual, in improving the works, or paying off borrowed money. The gas to be supplied is to have the illuminating power of fourteen candles, tested by Sugg's "London" Argand burner, No. 1. The ordinary day and night pressures are prescribed.

The *Imperial Continental Gas Association Act* only authorizes the Association to supply gas and other means of producing light in our Colonies, as well as on the Continent.

The *Lancaster Gas Act* empowers the Lancaster Gas Company to enlarge and extend their works, and to raise further capital. The Company were incorporated in 1856 with a share capital of £30,000, with power to borrow £7000, which sums have been raised and expended, and converted into stock. By this Act the Company are authorized to raise additional capital to the amount of £66,400, carrying the ordinary borrowing powers. Auction clauses are prescribed, and the premiums are to be applied as usual in improving the works or paying off borrowed money. The dividends on the additional capital are limited to seven or six per cent., according as it is issued. The gas to be supplied is to have the illuminating power of fourteen candles, tested, as usual, by Sugg's

"London" Argand burner, No. 1. The customary day and night pressures are prescribed. Beyond this the Company obtain power to manufacture and deal in fittings and all appliances for the use of gas.

The *Mirfield Gas Act* empowers the Mirfield Gas Company to extend their limits, and to raise further capital. The Company were incorporated in 1860 with a share capital of £43,000. By this Act they obtain power to raise additional capital to the amount of £20,000, carrying the usual borrowing powers. At the same time they obtain authority to borrow £5000 in respect of their original capital. Auction clauses and the sliding scale are imposed, and the initial price is fixed at 4s. per thousand feet. The dividends on the additional capital, subject, of course, to the sliding scale, are limited to seven or six per cent., according as it is raised. The gas to be supplied is to have the illuminating power of sixteen candles, tested by Sugg's "London" Argand burner, No. 1. The ordinary day and night pressures are prescribed. Beyond this the Company obtain power to extend their limits, so as to include several townships in the vicinity.

The *Newcastle-upon-Tyne and Gateshead Gas Act* is to confer further powers on the Newcastle-upon-Tyne and Gateshead Gas Company. By an Act passed in 1873, the share capital of the Company was authorized to be converted into stock, the amount of which was fixed at £350,000. By the same Act the Company acquired power to raise further capital to the extent of £100,000, all of which has been issued and expended, and the Company have borrowed on loan £97,935. The demand for gas in Newcastle and Gateshead is continually increasing, and the Company were wishful to add to their capital. By this Act the Company obtained power to raise a further sum of £300,000 in consolidated stock, carrying corresponding borrowing powers; and this is to include any premiums raised by the sale of such stock, which, of course, is to be first offered for sale by auction or tender. The stock is not to be issued until, nor shall any portion vest in any person accepting the same unless a sum not being less than one-fifth part of such stock has been paid up in respect thereof. But it is subsequently enacted that the full nominal value of stock sold, together with the premium, shall be paid to the Company within three months of the sale. The Company can only issue in one year the sum of £75,000, but if they do not exercise the full power in any one year, they may in any subsequent year create and issue the deficiency in addition to the amount prescribed, so that the amount issued in no case exceeds £75,000. In case of a proprietor at any auction making an equal bid with a stranger, the former is to have the preference, and to be deemed the purchaser. As usual, stock not sold by auction or tender is to be offered to existing proprietors at the reserve price, and any premiums realized at the sales are to be applied in the ordinary way; that is, to improving the works or paying off mortgages. The dividends of the Company are limited to seven per cent., and whenever gas is sold below 2s. 9d. per thousand feet the Company may increase their dividend at the usual rate allowed by the sliding scale; otherwise the maximum charge is to be 3s. 4d. within the borough, and 4s. without. The reserve-fund allowed is not to exceed eight per cent. of the nominal amount of the capital. Borrowed money converted into capital is not to be entitled to more than five per cent. dividend. The gas supplied in the borough of Newcastle is to have an illuminating power of fifteen and a half candles, tested by Sugg's "London" Argand burner, No. 1; the quality of the gas supplied to the borough of Gateshead to remain as hitherto. The gas is not to contain more than twenty grains of sulphur impurity in one hundred feet, estimated by the apparatus of the Metropolitan Gas Referees. The Act also gives the Company power to manufacture and supply all kinds of apparatus for the production and distribution of gas for any purpose whatsoever.

The *Plymouth and Stonehouse Gas Act* authorizes the Plymouth and Stonehouse Gaslight and Coke Company, who started in 1855 with a capital of £75,000, all of which has been paid up, and who have since issued further capital amounting to £20,000, one-half of which has been paid up, to raise additional capital to the extent of £60,000, with proportionate borrowing powers. The Company's Bill did not propose auction clauses or the sliding scale; but Mr. Raikes, we presume, was inexorable, and the new shares are, as usual, to be disposed of by auction or tender. The sliding scale is also introduced, the standard price being fixed at 2s. 6d. per thousand feet. The illuminating power of the gas supplied is to be fourteen candles, tested by Sugg's "London" Argand burner, No. 1. A testing-station is to be established at the Company's works within six months of the passing of the Act. The excess of profits beyond what are necessary to pay the statutory dividends may be invested, first of all to form an insurance, and thereafter a reserve fund, which shall be applied to the making up of deficiencies of dividend. The insurance-fund is limited to one per cent. of the capital, but the reserve-fund is, of course, unlimited.

The *Preston Gas Act* authorizes the Preston Gas Company, who were incorporated in 1865 with a capital of £120,000, and who subsequently increased it by adding another £120,000, and have borrowed to the amount of £60,000, to raise new capital to the extent of another £120,000, which amount is to include any premiums realized by the sale of shares or stock. The provisions relating to the creation and issue of this new capital are somewhat peculiar. Only £30,000 can be issued in the year following the passing of the Act, and in subsequent years not more than £15,000 can be issued at one time; but if the full amount which the Act authorizes the Company to raise in one year be not created, the deficiency may be called up in any subsequent year, in addition to the amount authorized to be called up in that year. The new capital carries the usual borrowing powers, and the Act prescribes that these powers shall be strictly exercised, as no fresh issue of shares can be made until the borrowing powers in respect of previous instalments shall have been fully put in force. It would almost appear that the borrowed money cannot be paid off, for the eighth section of the Act prescribes that in case the Company shall pay off any money which by the Act they are authorized to borrow or continue on mortgage, they shall forthwith re-borrow the same, it being, it is said, the true intent and meaning of the Act that the Company shall for the time being exercise fully their borrowing powers. The dividends payable on the additional capital are to be seven or six per cent., according as it is issued as ordinary or preference. The new shares are to be offered by auction or tender, and the full nominal amount of the share, together with the premium, must be paid before the share can vest in the purchaser, and the payment must take place within three months of the day of sale. The illuminating power of the gas to be supplied, and the test-burner to be used, are to be the same as those prescribed in the Company's Act of 1865. Gas is to be furnished at the usual day and night pressures. The price which the Company may charge for gas in the out-townships within their limits is not to exceed 5s. per thousand feet, except in the township of Walton-le-Dale, where the price is to be 4s. 7d. The Act further gives the Company power to take licences for the use of patent rights, provided they are not exclusive.

The *South Shields Gas Act* confers additional powers upon the South Shields Gas Company. By an Act passed in 1857, the share capital of the Company was fixed at £40,000. In 1867 another Act authorized the Company to raise an additional £40,000, with power to borrow £10,000. All this capital has been issued in ordinary shares, which are fully paid up, and the borrowing powers have been exercised. By this Act the Company obtain power to raise a further sum of £80,000 in stock, which is, of course, to be offered by auction or tender. The standard price of the gas, which is have an illuminating power of sixteen candles, is to be 3s. 3d. per thousand feet within the boroughs of South Shields and Jarrow and the district of the Local Board of Health of Hebburn, and 4s. beyond. The test burner is to be Sugg's "London" Argand, No. 1, which is described in the Act. As regards purity, the old testing clauses are retained, which prescribe that sulphuretted hydrogen shall be tested for by a strip of lead paper being exposed for one minute to a current of gas issuing at the rate of five cubic feet per hour. No more than twenty grains of sulphur are to be allowed, and the test for this impurity is to be made with the London Gas Referees apparatus.

The *Stourbridge Gas Act* confers further powers on the Stourbridge Gas Company. By an Act passed in 1855, the Company were empowered to raise capital to the amount of £15,000, and by a subsequent enactment in 1866 they were empowered to raise further capital to the extent of £12,000, all of which has been paid up and expended, and the Company now have a mortgage debt of £1000. By the present Act the Company acquire power to raise a further sum of £50,000 with proportionate borrowing powers. Gas of fourteen-candle quality is to be supplied, tested by a burner described in the Company's Act of 1866. No maximum price is mentioned in the Act just obtained, so that the charge will remain as fixed by the Act of 1866. The new shares are to be offered by public auction or tender, but no sliding scale is mentioned. The pressures at which the gas is to be supplied are those usually prescribed.

THAMES MUD-BANKS AND THE SEWAGE OUTFALLS.

THE proceedings in the arbitration case with reference to the outfall sewers in the Thames stood adjourned from Thursday last until the early part of next month. Since we addressed our readers on the subject of this inquiry last week, there have been still clearer indications of the extent to which the case of the Conservators is to be limited. In fact, the limitation has been carried so far that in some quarters it has been spoken of as a "change of front." During the examination of Mr. Leach and Captain Burstal, the tendency to depart from Captain Calver's report became particularly marked. On Tuesday, when Mr. Leach, the Engineer to the Conservators, was being cross-examined by Mr. Bidder, the counsel proceeded to question the witness on a passage in Captain Calver's "Rejoinder;" whereupon Mr. Pope, the leading counsel for the Conservators, interposed, saying: "We do not hold our- "selves responsible for all that Captain Calver has written. "We may use it in any way, but we do not hold ourselves "responsible for everything it contains."

The necessity for disconnecting the statements of Captain Calver from the case of the Conservators becomes increasingly apparent as we study the evidence given by Mr. Leach and Captain Burstal, especially that of the former. Mr. Leach is perfectly certain that the mud-banks are caused by the discharge from the sewers; but while undergoing re-examination by Mr. Aston, the junior counsel for the Conservators, this witness said he could not account for the presence of the deposits, except by "taking into account the storm outflow," adding, "I attribute them more to that than to anything "else." Mr. Aston thereupon remarked: "That is a matter "of opinion, founded upon experience;" to which Mr. Leach replied: "To my mind, it is a matter of proof." The question then came up: "In what way do you say that it is a matter "of proof?" The witness replied: "Because I know it to "be a fact that this silica or sand, or whatever you call it, is "deposited in very large quantities in the main sewers of the "Metropolitan system." To show that he had personal knowledge of this fact, Mr. Leach said: "I have seen the stuff that "has been got out of these sewers." He had also "seen the "stuff that was taken from the mud-banks." Whether "taken out of the sewers" would mean "taken out of the "catch-pits" is not clear. While undergoing cross-examination by Mr. Bidder a few minutes before, Mr. Leach had his attention drawn to a statement made by Dr. Letheby in 1875, that the mud in the vicinity of the outfalls contained seventy-two per cent. of silt and sand. This statement was accepted by Mr. Leach as correct, and he explained the large proportion of sand as due to the detritus which was brought down the sewers during storms of rain. He added: "I would "not say that it is all to be accounted for in that way, but a "great deal of it is." We have already seen that Mr. Leach attributed the mud-banks to the storm outflow "more than to "anything else." At a later period, the detritus was designated "road drift," which Mr. Leach defined as material "worn off the macadamized road, and washed along the "inverts of the sewers."

It is due to Mr. Leach to state that ten years ago he expressed the same theory about the presence of "road drift" in the mud-banks of the Thames. But the public will probably feel some relief on learning that the "banks" of fœtid matter which figure in Captain Calver's report are now superseded by mud-banks containing fully seventy per cent. of "road drift." As ordinary samples of sewage fail to yield mud containing so large a proportion of "road drift," it is naturally suggested that the detritus found in the mud-banks is stuff washed out of the sewers during storms. Hence the ordinary samples of sewage fail to afford direct evidence on the subject. So also the absence of matters indicating the actual presence of sewage may be accounted for on the theory that these are all gone, but have left the detritus behind, the latter being evidence of the previous existence of sewage, somewhat as the nitrates in the drinking water analyzed by Dr. Frankland. If this gentleman appears as a witness before the Arbitrators, perhaps he will throw a little further light on this part of the subject.

The theory that the storm overflow is the principal cause of the mud-banks in the Thames is beset with some difficulties. In the first place, there are several outlets for storm waters, designed to relieve the main outfalls. Hence much of the road drift is likely to get into the Thames long before the stuff has travelled in the sewers as far as Barking and Crossness. If road drift will create mud-banks at these latter places, it must do the same, and perhaps on a larger scale, at Chelsea and elsewhere. It is, indeed, alleged by the witnesses for the Conservators, that there are banks of sewage mud in front of St. Thomas's Hospital, and in other parts of the river above bridge. Mr. Leach asserts that sewage mud shows itself from Kew to Sea Reach. This will, therefore, cover all the range of the storm outlets, and considerably more. But if this view of the case is to be maintained, it must be shown that there is enough road drift to form three-fourths of nearly all the mud-banks in the river. There is, however, another element to complicate the case. Mr. Leach states that there are sand-banks in the river as well as mud-banks. As the mud-banks are three-fourths "sand and silica," it seems rather difficult to establish a distinction. But there is said to be a difference between sea sand and what we may call road sand. Captain Burstal speaks of "a salt water sand" as having existed at Jenningtree Point between 1832 and 1861, and fortifies his statement by saying, "It was pretty well known at that time "that all the mortar that was made from that sand built damp "houses." All the sand-banks in the river are not credited with coming from the sea, but none of the mud-banks are allowed by Mr. Leach to be the natural deposit of the Thames. Still, it may be said that if heavy stuff will come up from the sea, lighter stuff, such as gets washed away from the marshes or "saltings," is very likely to find its way up to the same point, or even rather higher.

Mr. Leach stated in his evidence that there were no mud-banks "in the main channel of the Thames" before the outfalls were completed—at least, not such as now exist below Woolwich. On the foreshores of the river, he says, there were considerable mud-banks before the construction of the outfalls; but he believes that the mud did not then extend below low-water mark, and these mud-banks were all above Woolwich. Mr. Leach does not state that the mud which formerly accumulated in the Metropolitan portion of the Thames now goes to swell the deposits in Barking Reach, or, if he does entertain that view, he does not allow that the mud on the foreshores above Woolwich is any less than formerly. In reference to the mud-banks which he says existed on the Metropolitan foreshores before the construction of the main drainage works, he is asked: "What has happened to those "mud-banks since the outfalls have been created?" To which he replies: "They have been increased, I believe—in "fact, I am sure of it—very much;" and he specifies that he means above London Bridge. The statement is somewhat startling, and is not very likely to meet with general acceptance. The increased depth of the river channel in the Metropolitan area is a fact beyond dispute, and the Thames Embankment allows less space than formerly for the deposit of mud. The deepened bed, as exemplified by the undermining of the bridges, and by other phenomena, admits of a greater volume of tidal water coming up from the sea, and this raises the level of high water, while at the same time the level of low water is lowered. There is a steeper gradient in the river-bed within the area of the Metropolis, and the scour is increased. How the mud can also be increased, it is hard to understand. The question is one which Sir Charles Hartley is well qualified to deal with, and we may congratulate both parties on the special knowledge which the Umpire is able to bring to bear on this matter.

We suggested last week that the Metropolitan Board would not altogether object to the statement that the mud taken from a catch-pit in Queen Victoria Street was identical with the mud in Barking Reach. So long as the Metropolitan Board had to meet the charge that the outfalls created banks of sewage, this suggestion would hold good. But the case now presents another aspect, the road drift being made more prominent than the sewage. The Metropolitan Board may, therefore, endeavour to show that the road drift in Queen Victoria Street is composed of materials differing from those which constitute the mud-banks. The latter are stated—as in the evidence of Mr. Abernethy, on Thursday last—to consist of road detritus at the base, and the lighter ingredients of sewage mud at the top. A very careful examination of this alleged detritus must now take place, in order to determine whether or not it has passed through the sewers. Mr. Aston, in re-examining Mr. Abernethy, endeavoured to elicit a statement that the lower strata of the mud-banks consisted of particles of matter which were obviously "pounded, or "rubbed, or eroded Aberdeen granite." But the witness would go no farther than to say that they were "silicious "particles." Mr. Bidder accordingly rejoined: "Silex is "not peculiar to granite;" to which Mr. Abernethy replied: "No, it is not peculiar;" adding, by way of explanation: "It forms part of greenstone and syenite too." The witnesses on the other side will doubtless extend the catalogue. But Mr. Abernethy cited these silicious particles as proving that the deposits were not from the "saltings." Later on, one of the Arbitrators, Mr. Bramwell, asked the witness whether he

had heard the evidence of Captain Burstal as to the "deposits "of sharp sand, which were sought for by builders, and which "Captain Burstal attributed to the sea." Mr. Abernethy had heard the evidence, but did not know where such banks were to be found. Mr. Bramwell observed that Blackwall Point had been named as one of the places where such deposits existed. Mr. Abernethy replied that he heard the statement, but he reserved his opinion on the subject until he "knew the "specific gravity of the sand, and more about it." Mr. Michael interposed with the remark, that what Captain Burstal said was quite independent of the specific gravity, stating that the sand was so salt as to be unfit for use by builders. It was, as the learned gentleman expressed it, "hygrometric."

The course of the proceedings before the Arbitrators shows the Conservators, on the one hand, defending the saltings, and the Metropolitan Board in like manner vindicating the outfalls. Traced in all its bearings, the question has a very tangled appearance. The evidence which excludes the idea that the saltings have produced mud-banks would seem to exonerate the outfalls, and the evidence which condemns the outfalls would seem to prejudice the saltings. Mr. Bidder and Mr. Abernethy thrashed each other soundly over a knotty problem in hydraulics, which nobody seemed to understand. The behaviour of a solid particle at the bottom of a river, when exposed to the pressure of the current, was the question at issue; or, at least, such seemed to be the question, for we should be sorry to speak positively on a point concerning which no two persons were agreed. Mr. Bidder was provoked into saying that one principle laid down by Mr. Abernethy was "a pure fallacy, contrary to all the laws of "hydraulics;" to which the witness retorted by asserting that a proposition which Mr. Bidder had enunciated was itself contrary to all the "known" laws of hydraulics. The contention lasted a long time, despite the efforts of Mr. Bramwell to clear matters up, and afterwards there was a debate nearly equally severe over "sectional areas," Mr. Bidder complaining that Mr. Abernethy had told him the same thing seven times over, and yet had not answered his question. But perhaps the most extraordinary cross-examination of any was that which occurred in the case of Lieut. Dawson, from whom Mr. Michael failed to elicit anything, the witness being so particular in ascertaining exactly what Mr. Michael intended by his questions, that the latter got very little else than questions in return. One amusing incident was the statement by Lieut. Dawson that he had seen the outfalls "in the distance," explained to mean "about a mile off," the most conspicuous object being certain "chimneys," supposed to be connected with the outfalls, as they were "stationed "very near it." On the whole, we should say Mr. Michael never had a more invulnerable witness to deal with.

The contention over the road drift will evidently be a prolonged and determined one. The course of cross-examination shows to some extent how the Metropolitan Board will deal with this feature. If the velocity of the sewage is sufficient to transport the detritus along the sewers, why should not the velocity of the tide be sufficient to convey it down the Thames? If there is such a quantity of this stuff as to create huge shoals in the neighbourhood of the outfalls, it ought also to betray its presence in the sump pits and sewage reservoirs. The microscope will doubtless be employed to test the identity of road dust and the silicious particles of the mud-banks. As for the lighter elements of sewage which are said to cap the detritus, the witnesses for the Metropolitan Board may undertake to show that the ingredients are innocent of sewage, and were never inside the sewers at all. The chemists will find their battle-ground here. On the part of the Conservators it is contended that the Thames in its natural state will not deposit mud. Remove the present mud-banks, and keep all sewage out of the river, and henceforth no mud-banks will be found. Such is the allegation of Mr. Abernethy and others. Evidence, of course, will be brought on the other side, and to some extent the Metropolitan Board will be able to make use of the weapons of their antagonists. Admitting that there are mud-banks, the Board will point to the saltings, which their witnesses allege have been washed away to an enormous extent. Mr. Abernethy, for the Conservators, says: "A river possessing sufficient hydraulic depth—sufficient mo-"mentum of current—will carry light matter in suspension, "and take it to sea." In the same answer Mr. Abernethy went on to state: "The River Thames is capable of carry-"ing the matter out to sea, and maintaining a clean gravel "bed, as formerly." If the river is thus able to dispose of all the earthy matters brought down by land floods, or washed away from the saltings, it is open to the Metropolitan Board to argue that the light suspended matters of sewage ought to be got rid of with equal facility. The heavy detritus is another question, and the witnesses for the Board will have to show that the heavy matter at the base of the mud-banks entered the river from some other source than the outfalls. It is tolerably certain that there will be a vast amount of cross-firing over these questions, and it will be no very easy task to ascertain on which side the victory properly rests.

Among the witnesses remaining to be called for the Conservators are Dr. Williamson, Mr. Shelford, Mr. Mansergh, and probably Dr. Frankland. The Court reassembles on Monday, the 8th prox., and it is intended that the sittings shall be continuous day by day through the week. As a contribution to the controversy, perhaps we may suggest a theory which to some extent reconciles opposing views. The Thames must be a very exceptional river if it fails to bring down a quantity of earthy matter from its watershed area. According to Professor Huxley, the quantity thus abraded and carried off is very considerable. It cannot be that any large proportion of this matter is permanently arrested by the locks which exist at Teddington and upwards. The water that pours over Teddington weir must bring a due proportion of earthy particles with it, and a deposit of this suspended matter necessarily takes place wherever the stream is checked, whether the interruption is caused by bends in the river or by any artificial obstruction. The suspended matter in a gallon of average Thames water is, of course, less than in a gallon of average sewage; but the volume of the river is very much larger than the volume of the sewage, thereby rendering the absolute quantity of solid matter in the Thames much larger than the quantity which traverses the sewers. The whole of the sewage has to be discharged from the outfalls during the first three hours or so of the ebb tide, and any one observing what then takes place will see that the impact of the sewage interferes with the downflow of the river, so as to produce a considerable extent of dead water outside the limits of the dark current which indicates the sewage. We would, therefore, suggest that if it be shown there is no deposit whatever from the sewage, it might yet be proved that the check given to the flow of the river led to some deposition of earthy particles, so as to occasion mud-banks. These mud-banks would not be sewage, although caused by the action of the outfalls. According to our hypothesis, these mud-banks (meaning the three which are specified by the Conservators) would be formed just as inevitably, even if the discharge from the outfalls consisted of a liquid as pure as distilled water.

We present the foregoing explanation quite hypothetically, and shall observe whether the progress of the case before the Arbitrators will afford any proof of its correctness. Respecting the future destiny of the northern sewage, or a part of it, we observe that notice has just been given of a scheme called the "Dagenham and District Farmers [Optional] Sewage "Utilization." Parliamentary powers are thus sought to establish a Company which shall construct conduits and pumping-stations to draw off more or less sewage from the northern outfall sewer of the Metropolitan Board, and distribute the fertilizing liquid to the Essex farmers. As many as thirty conduits are specified, passing through the parishes of Barking, Dagenham, Hornchurch, Rainham, Wennington, and Aveley. On this occasion we hear nothing of the Maplin Sands, that desolate area being left to the domination of big guns and giant projectiles.

LIGHT, HEAT, AND POWER IN DWELLING-HOUSES.

In the current number of *Scribner's Monthly Illustrated Magazine*, an American publication which is also issued in the form of an English edition, and bears a high character for excellent variety of matter, there appears a thoughtful article on Light, Heat, and Power for the Householder, which, presented in popular guise, is eminently likely to be read in circles otherwise unpenetrated by similar teaching. The writer divides his subject into the three heads above mentioned, and his remarks are well worth attention. In stating the rival claims of gas and oil in lighting dwelling-houses, he gives great prominence to the two elements of commercial value—first cost; and maintenance, or second cost. This way of analyzing the financial part of the question is rarely stated as fully as it deserves to be; but even the existence of such a division, once recognized, is sufficient to suggest a whole train of considerations otherwise overlooked.

Fairly as stated by Mr. Charles Barnard in the article under consideration, a lamp, an oil-can, and a quart of oil cost so much delivered. That is the prime cost, to which may be also charged the oil subsequently bought. The second cost is made up of the labour of filling the lamp, trimming it, and transporting it where required for use. If the time taken up in this way is estimated at only ten minutes per day, there will be over sixty hours, or an entire working week of ten hours per day, absorbed in the course of a year. This is

a very considerable tax on the energies of a busy householder. There is practically no second cost in burning gas, the time necessary for lighting it being momentary. The first cost of gas—that is to say, the net value of the fittings and gas consumed—is all the expense arising from it. The initial cost of gas and oil, as far as comprised in the value of the fittings and lamps, cannot exactly be compared, as it varies with each individual consumer; but, on the whole, it may be taken for granted that lamps cost less than gas-fittings. In ordinary houses, in the towns of the United Kingdom, the cost of the gas and oil actually consumed will about equal each other, and the more completely the house is lighted by gas, so as to render chamber lamps and candles unnecessary, the less will be the average cost of the light actually utilized. Hence it would appear that the first cost of oil is less than gas, and the second cost more, and we shall arrive at the true total cost by adding the respective first and second costs together. For obvious reasons, these totals will always vary with each consumer. When the householder is a busy man or woman, the time occupied in filling and trimming lamps will be objected to; and yet, for the sake of safety and a good light, personal care in the performance of this unpleasant duty will probably be considered necessary by careful persons. On the other hand, of course, there are people whose time may as well be occupied in arranging lamps as in anything else. It is a matter for individual decision. The questions of safety, liability to waste, and constancy, in all which gas possesses important advantages, are to be considered apart from the economical side of the comparison; although the danger from explosion and fire is capable of valuation, and increases the second cost of oil to a serious extent. Candles cost less in establishment charges than either gas or oil; but if their first cost be measured by the light given, they appear very dear.

Proceeding from present facts to future anticipations, Mr. Barnard asks what may be expected from these sources of supply, and if there is any new source. He thinks it very doubtful if any great improvements will be made in lamps or candles. The latter certainly are about as perfect as they can conceivably be made, but that would be rather a bold assumption in the case of the former. The experience of centuries would have seemed, at first sight, to have long since explored all the possibilities of lamp construction, yet we all know what has been done in the way of the improvement of these articles during the present generation. As to gas, it is a mere infant in comparison with oil, and therefore in one sense may be expected to improve out of all knowledge as it grows. Yet we must not forget that its infancy, such as it is, has been passed in a time of active progress, and the expression, "Better fifty years of Europe than a cycle of Cathay," contains much truth, which may be amplified into the statement that anything which has been developed under exclusively modern influences is perhaps as advanced as if it had been known during many earlier years. Still, there is an infinitely wider field open for the improvement of gas lighting than for its only formidable present rival.

Speaking for the United States, Mr. Barnard says: "When gas is delivered at fifty cents. per thousand feet, it will, in improved lamps, be used with even more freedom than now." The equivalent to that price has already been reached, with gratifying results, in several towns in the United Kingdom.

In noticing the electric light, Mr. Barnard is careful to state that both its first and its second cost are at present too unsettled for comparison, even if its other attributes were better ascertained, which is not the case except for large areas. It has the future before it, and so has gas, and they will in due time fight it out between them.

Turning to the subject of heat, it is premised that the wood and coal supply of the United States, and the stoves used for their consumption, are cheap and of a high order. Yet the claims of the oil-stove and the gas-stove are coming forward there, as well as in countries where the solid fuels are dear. "The first cost of heat from coal is low, but the second cost is very high." This second cost includes bringing coal to the fire, making and attending on it, and removing the ashes and cleaning up. To this might be added the dirt and destruction, with the attendant cost of washing and repairs, invariably caused by coal fires in furnished rooms. Then the waste of fuel in getting up heat for the purpose desired, and letting it down again after its work is done, is something considerable. Besides, the best stoves only use a small percentage of the actual energy of the fuel. Thus even cheap fuel and cheap and good stoves leave much to be desired, and several systems have been initiated to avoid these drawbacks. One plan is to have steam laid on in pipes, like gas or water, and used as required, and charged somewhat on the same system. Mr. Barnard states the first cost of this method to be rather less than when fuel is burned in the house, and the second cost very much less, as there is no coal to be carried, no dirt or ashes to be cleaned or removed, and no heat wasted after its work has been done.

Another and still better idea is to supply non-luminous gas fuel, which Mr. Barnard expects will be ultimately adopted universally. The first cost of such a fuel would be less than any fuel we have at present, and its second cost would be almost as insignificant as lighting gas. As he says, if a gas fuel can be delivered at about twopence per thousand feet, the whole question of heating and cooking is practically settled in towns; but this desideratum is not yet. Even with the high price of gas fuel as at present supplied, an economical advantage is found in the fact that by its constant use, in some cases, the time of the house-mother is so spared that the employment of a servant is rendered unnecessary, herein making the second cost of other fuel appear very conspicuously. In fact, the second cost is by far the more important of the two, and the more this is recognized, the more demand there will be for gas fuel. But, as stated at the beginning of this article, the very existence of such a factor requires to be carefully explained to householders not of an analytical turn of mind. When such people are debating within themselves the *pros* and *cons* of coal *versus* gas for cooking purposes, they are apt to overlook the important consideration that the unsuspected but continual labour and care of the old system will entirely disappear with the adoption of the new, leaving unaccustomed opportunities for other duties and pleasures.

Under the heading of power comes a host of domestic subjects, which we have been accustomed to see treated in an original and ingenious manner by Americans. Labour-saving appliances seem to possess wonderful attraction for the Transatlantic mind, especially in those minor matters which the differently attuned genius of older nations has been content to let follow the customs of ages. There can be no doubt that the days of the household drudge are numbered, for the School Boards are turning out a class of "operatives," who, if they take to housework, will henceforth do so as a trade, and less as a servitude. America has felt this tendency first, but there is no doubt that our turn is coming fast. The value of domestic labour will rise, and even if the old willingness to drudge remains, the necessity for getting more and better work done by hands that cost more to keep, will prevent continuance in the old tracks. Instead of regretting the increasing scarcity and approaching extinction of the drudge, we must prepare ourselves for it, and hasten it, if possible, by providing a substitute for mere bodily strength, often so ignorantly wasted; and it is not far to seek. Domestic motors have made their appearance at various exhibitions, where they have attracted some amused attention, and probably also raised reflections, which, if translated, would indicate a dawning consciousness that there is a good deal of machine labour at present done by the costly power of beef and bread, occasionally also intractable, which might well be done by the cheap and reliable energy of steam, gas, or water.

In the order of cheapness, taking their first and second costs together, the existing available sources of domestic power are as follows:—The gas-engine, the hot-air engine, the steam-engine; to which may be added, in some cases, the wind-engine and hydraulic engine. Mr. Barnard adds his testimony to the value of gas-engines, which he pronounces emphatically to be the best and handiest motors we have, their second cost being so low. With cheap gas, he confidently looks to their agency for supplying an indispensable feature in domestic economy—that of power applied to washing and mangling machines, to sewing-machines, elevators, cleaning boots, knives, forks, and plate, &c.

If electricity should ever become a source of light for dwelling-houses, it will at the same time supply power in even more convenient shape than gas; but, as we have seen, that eventuality is not at present within the bounds of practical discussion. It may perhaps prove economical to produce electricity by the primary evolution and conversion of heat, and then again to convert it back to power, but all that can be said at present is that we do not see our way clearly in that direction.

Finally summing up his thoughtful little essay, Mr. Barnard—and herein we agree with him—asserts that gas, in its present or modified form, is likely to supply the want of the public in the matters of light, heat, and power, both now and in future, seeing that it possesses qualifications which are not likely to be superseded by anything of which we have any definite knowledge.

Communicated Article.

SULPHUR IN COAL GAS.

By "DELTA."

(*Continued from p.* 739.)

In the ordinary test for sulphur in coal gas, the gas is burnt near the bottom of a bent funnel-shaped tube, and the products of combustion pass up this tube into a condenser containing glass balls moistened with water. Below the flame are placed pieces of ammonium sesqui-carbonate, giving off gaseous ammonia, which is carried up with the ascending current of hot gases from the flame, and is condensed by the water on the glass balls. The air is admitted to the flame through orifices below the level of the burner, and the flame is so regulated as to be non-luminous. To the condenser is attached a long inclined tube, to act as an "inverted condenser" to any vapour which may escape condensation in passing over the moist surface of the balls. The steam produced by the flame collects in the condenser, and passes down into a bottle placed to receive it. The lower layers of balls in the condenser are kept hot by the condensation of the steam. Under these conditions the sulphur in the gas is completely oxidized to sulphuric acid, and is estimated in the liquid from the condenser by precipitating it with a barium salt, and weighing the barium sulphate produced.

On the other hand, when hydrogen sulphide or carbon bisulphide is burnt in the open air of a room, no measurable quantity of sulphuric acid is formed in the actual burning. Liquid carbon bisulphide lighted in an open dish burns with a pure violet flame, and gives off fumes of unburnt sulphur, showing that all the sulphur does not get oxidized in the flame, even to sulphurous acid. When sulphur alone is burnt in air or in oxygen, it is completely oxidized to sulphur dioxide, and a small portion is further oxidized to sulphur trioxide. M. Berthelot, in his experiments on the heat of chemical combination, could not succeed in making sulphur combine with oxygen in a closed vessel to form sulphur dioxide without producing a certain quantity of the higher oxide, and he had to correct his thermal result accordingly. But, in the presence of hydrogen or carbon, sulphur undergoes only the lower oxidation into sulphur dioxide, when burnt in the air. To oxidize the sulphur dioxide

produced in a flame by the burning of sulphur compounds, it is necessary for the dioxide to remain in contact with oxygen at a high temperature in the presence of moisture for a considerable time. It is, indeed, possible to oxidize the dioxide quickly to the trioxide, by passing the dry gas, mixed with dry oxygen, over finely-divided metallic platinum, the union being probably effected by the power which platinum possesses of condensing gases on its surface, and so bringing them in contact one with the other. But, except under these special conditions, dry sulphur dioxide does not unite with dry oxygen, and sulphur trioxide itself is readily broken up by heat into the dioxide and free oxygen.

Sulphur dioxide very readily dissolves in water, forming a solution of sulphurous acid, which on boiling gives off sulphur dioxide, water being left. So long as sulphur dioxide remains as a gas mixed with, and floating in the atmosphere, there are no means of determining whether it unites with the molecules of steam, also pervading the air, forming molecules of sulphurous acid, thus:—

SO_2	+	H_2O	=	H_2SO_3
Sulphur Dioxide.		Steam.		Sulphurous Acid.

or whether it remains in the free state until it meets with liquid water deposited on an exposed surface.

It is contended by Dr. Frankland that the reaction above represented does take place in a room in which coal gas is burning. At all events, that gaseous sulphur dioxide, steam, and oxygen unite to form sulphuric acid, which, being non-volatile at ordinary temperatures, condenses in the form of minute drops producing a sulphuric acid cloud. This sulphuric acid cloud is partly swept from the air of the room by the processes of ventilation, and is partly deposited in minute drops on the walls, furniture, and decorations. "For all practical purposes," Dr. Frankland says in his evidence, "it may be held that in a room in which gas is burnt freely in the open air of the room, all the sulphur passes into the state of combination known by chemists as sulphuric acid, or oil of vitriol; and 100 cubic feet of gas containing 40 grains of sulphur would produce, when burnt, rather better than 122 grains of oil of vitriol."

Let us see how far experimental facts confirm this view. Dr. Frankland found that when the products of the combustion of coal gas were passed through a trumpet-shaped tube into a cylinder, from which the uncondensable gases escaped by a second tube, a certain portion of the sulphur dioxide produced became oxidized, and that the water in the condenser then contained a mixture of sulphurous and sulphuric acids. On using a larger cylinder to condense the vapours from the same gas, he found the liquid in the condenser to contain a larger proportion of sulphuric acid, and he accordingly argues that if the condenser were still larger all the sulphurous acid would become oxidized to sulphuric acid. The reason why more oxidation takes place in the larger cylinder, says Dr. Frankland, is that the warm sulphur dioxide and oxygen are longer in contact than in the smaller cylinder. A room in which coal gas is burnt is only a large condenser, and therefore he concludes that all the sulphur in the gas burnt in a room gets converted into sulphuric acid.

But surely there is a great difference between the two cases. The apparatus Dr. Frankland employed is practically the same as Dr. Letheby's apparatus for estimating sulphur. A quantity of water is condensed on the sides of the cylinder. This dissolves the sulphur dioxide, forming sulphurous acid, which is then under precisely the most favourable of conditions for oxidation—being subjected to a current of hot air in a warm vessel. Of course, under such circumstances a large proportion of the sulphur in coal gas is found oxidized to sulphuric acid. But the sulphur dioxide evolved from a coal gas flame burning in an ordinary room does not meet with similar treatment. The steam produced from the burning coal gas is not liquefied in a condenser, but diffuses as steam throughout the atmosphere of the room, which is usually a long way from the point of saturation, so that no deposit of moisture takes place. In the upper part of the room, where the "sulphur" is said to commit its greatest ravages, the air is farthest from its saturation point. Moist substances would more readily give up their water if placed near the ceiling than if laid on the floor of a gas-lighted room. The room then differs from the experimental cylinder in the fact that in the room the steam can diffuse into the unsaturated air; in the cylinder, diffusion is prevented, and the steam liquefied in the vessel and condensing tube before it can reach the outer air. From the latter, water runs back into the condenser, and we have what we do *not* have in a room—a large surface of warm water, over which the heated sulphur dioxide and oxygen have to pass. To explain the action of the condenser, it is not at all necessary to suppose that sulphuric acid is first formed and precipitated on to the sides of the vessel; but it is far more probable that the sulphur dioxide is first dissolved by the water and then oxidized.

That, under certain conditions, sulphuric acid is produced in a room lighted with coal gas, there is no manner of doubt. Most people have noticed the drops of oily brown liquid which collect in the glass bells hung over gas lamps to prevent the blackening of the ceilings. These drops are strong sulphuric acid. Many people have found their brass chandeliers corroded, and have scraped off a blue powder from the metal. This is copper sulphate formed by the action of sulphuric acid on the copper in the alloy. The sulphuric acid is probably produced in this way. On lighting the gas a current of hot gases and vapours ascends, and the chandelier or the glass shade not being yet warmed, condenses the steam on its surface. Drops of water are thus produced, which dissolve the sulphur dioxide coming from the flame, and the solution of sulphurous acid so formed gets oxidized by the current of hot air playing over its surface. The chandelier or glass bell quickly becomes hot, the unoxidized sulphur dioxide is given off by the water, which itself quicky evaporates, but the small portion of sulphuric acid formed remains unchanged where it was formed, being non-volatile at the temperature reached. The minute drop of sulphuric acid picks up during the daytime some water from the air, the glass (or brass) having cooled down on the gas being turned off. When the gas is lighted again the same process is repeated, until at the end of some weeks or months an appreciable deposit of acid is formed. The brass chandelier and the glass shade act the part of a Letheby's condenser for a short period every evening. But the rest of the room is not so acted upon under ordinary conditions. The steam from the gas diffuses through the room, the atmosphere of which is generally considerably above the temperature at which water would begin to condense on surfaces. After the gas has been burning some hours, the hygrometric state of the air, which we may regard as the fall of temperature necessary to produce a deposit of moisture on the objects in the room, remains nearly constant. This equilibrium is maintained by ventilation. The steam poured into the air of the room is carried away as steam, and spread through the air outside, together with the sulphur dioxide gas, which has had no chance as yet of becoming oxidized. Of course, in a room where all ventilation is stopped, the atmosphere will eventually become saturated with aqueous vapour; and, if the gas continue burning, some moisture will be deposited on the walls and furniture, and sulphuric acid will be found dissolved in it. But in an ordinary room the air is frequently changed, and on this point the evidence of Dr. Odling is very valuable. He estimates the volume of sulphur dioxide produced to be about the one-thousandth part of that of the carbonic acid produced when coal gas containing 40 grains of sulphur in 100 cubic feet is burnt; and since 0·3 per cent. is a very large amount of carbonic acid to be present in a room, it follows that even under bad conditions the volume occupied by the gaseous sulphur dioxide is only three-millionths of the total volume of air. Unless it were continually being condensed, this small volume of sulphur dioxide could produce but infinitesimal damage; but, except for a few minutes on surfaces immediately over the burners, there is no deposit of moisture in an ordinary room to condense the gas. As a matter of fact, except on such surfaces just over the flame, no sulphuric acid is found, and brasswork and fabrics of various descriptions may be kept in gas-lighted rooms for years without suffering damage from sulphuric acid. The very conditions which prevent the formation of sulphuric acid—viz., the *dryness* of the air, and consequent absence of moisture to dissolve the sulphur dioxide—produce the damage attributed to sulphuric acid. The oft-quoted destruction of bookbindings at the Athenæum Club was no doubt due to the heated condition of the upper part of the library. Mr. James Layton, who examined the bindings, found that the books which had suffered most were in the north library where no gas was burnt. These books had been kept very hot by the flues of the kitchen, which passed at the back of the book-shelves. In other libraries, where no gas was burnt, bindings were reduced by heat to an exactly similar state of rottenness.

In a room with ordinary ventilation it seems very improbable that any appreciable damage is done to books or furniture by sulphur in coal gas. Since the whole quantity in dispute is so minute as to have no injurious action on health, the London Gas Companies contend that they should be relieved from the necessity of lime purification, which involves great trouble and annoyance to the workmen employed, and a very grievous nuisance to the neighbourhood, as well as raising considerably the price of the gas. There can be little question a nuisance has been created by foul lime; the Companies have been indicted and the nuisance has been proved in Courts of Law. But the Metropolitan Board of Works are of opinion that by using proper precautions the process can be conducted so as to be innocuous. That some nuisance is inevitable with the foul lime process seems to be admitted by the Gas Referees, for while they only allow a maximum of 15 grains of sulphur in 100 cubic feet at the suburban stations, as at Beckton, they allow the town stations a maximum of 20 grains, so that the lime purifiers may be less frequently opened. The ventilation of the purifiers by drawing air through them has led in one case to an explosion, and in others to the injury of the metal holder, owing to the rise of temperature brought about by the rapid oxidation of the fouled lime. When air is drawn slowly through the purifier so as to avoid a rapid rise of temperature, the oxidation is tolerably complete in the end, but the process requires many days. The only method that has helped to abate the nuisance is the watering of the mass before it is dug out, so as to prevent the foul lime dust from blowing about, and the drawing down of air into the purifier all the time that the men are at work in it. With the very greatest care it has been shown to be possible to prevent the spread of dust during the emptying of the lime purifiers, and the evidence adduced on this point just turned the scale against the Chartered Company when they appealed to Parliament to have the sulphur maximum raised. It is *possible*, of course, to empty a purifier without allowing an escape of foul gases or foul dust; but it is very difficult, requires the greatest care, and is very costly in labour. But even granting the possibility of emptying the purifiers without creating a nuisance, what is to be done with the foul lime? At country and suburban works it is put on waste land, covered with a layer of soil, and left to slowly oxidize; at town works, carriers get 5s. a ton for taking it away in trucks or barges.

I have endeavoured to state the case without prejudice. In no other large city but London is coal gas purified from carbon bisulphide by means of foul lime. It is true that where a rich gas is manufactured, as at Manchester, consumers need to burn less gas to obtain the same light, but in other towns gas of lower illuminating power is produced, and more has to be burnt to get the same light.

At the Paris Gas-Works only oxide of iron is used in purificatron, though the coals that are employed contain on the average the same quantity of iron pyrites as English Pelaw Main coal. According to the report presented to the Parliamentary Committee on the Chartered Bill of 1877, by M. Dumas, who drew up the treaty between the City of Paris and the Paris Gas Company, the complaints from silversmiths, jewellers, and glass and crystal merchants were owing to hydrogen sulphide being present in the gas, and escaping through bad gas-fittings into the workshops. According to the terms of the treaty no hydrogen sulphide was allowed in the gas, and since the treaty came into operation no complaints have arisen of damage to metals, glass, or silk goods in Paris. It seems only reasonable to suppose that what happens in Paris and other cities would happen in London also, and that no appreciable damage would be done by an extra dose of sulphur, while the gas would be reduced in price at least 2d. per 1000 feet. It is to be hoped that foul lime will once more disappear. That sulphur may be removed from coal gas is desirable, but not at the cost of foul-lime purification.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

TAR CONDENSERS.

SIR,—I need hardly say that I accept as conclusive Mr. Livesey's statement in to-day's JOURNAL, that the 20 feet by 4 feet condensing-tubes at the South Metropolitan works were erected prior to 1871. But, with reference to his subsequent comment, I am bound to affirm, most confidently, that I never observed those tubes until fully a year after the publication of the "Ammonia Report," on which occasion I spoke of them to Mr. Livesey; and previously to that Report, neither Mr. Livesey nor any other person ever said a word to me, or in my hearing, either as to the use, or the usefulness of such chambers.

Nov. 11, 1879. R. H. PATTERSON.

SIR,—I have been, in common with others, very much interested in Mr. Patterson's articles upon the effect of the contact of tar with gas; but, with your permission, I should like to state that the employment of a large chamber, wherein, the velocity of the gas stream being greatly diminished, the tar might settle down, is not a new suggestion, for that eminent Engineer, the late Mr. John Malam, employed such a chamber at his Lynn Gas-Works upwards of 50 years ago. Its size, to the best of my recollection, was about 12 ft. square by 2 ft. 6 in. deep, for a make of gas that would be, I should imagine, about 10 or 12 millions per annum.

I mention this fact to show how a very old form of apparatus, the existence of which appears to have been lost sight of at the present day, again turns up, and its merits are endorsed by such practical men as Mr. Patterson and Mr. George Livesey. GEORGE DUNBAR MALAM.

Gas-Works, Bingley, Nov. 12, 1879.

STREET-LIGHTING CONTRACTS.

SIR,—"A Country Secretary," in the last issue of the JOURNAL, asks "Is it usual for Gas Companies to accept penalty clauses in their contracts with Local Authorities?" I should say it is; and let "A Country Secretary" take care that he be not fined for causes beyond his control.

The most obnoxious clause is that which inflicts a fine for "lamps out." You light the lamps—some fellows on a spree break the glass, and the lights become extinguished. The police state the latter fact; and, by the contract, you are fined, after having supplied the gas—although it was not burnt—and have your glass smashed besides.

In a paved town this is not much to be feared, for, besides the absence of small stones in the streets, it is generally well watched; but in country places it is quite otherwise.

There should be no fines unless the Gas Company fail to perform their duties. GEORGE ANDERSON.

35A, *Great George Street, Westminster, Nov.* 12, 1879.

PORTABLE GAS.

SIR,—Would any correspondent give me information respecting the manufacture and the apparatus used by the Portable Gas Company, of London, about 35 or 40 years since. The gas was supplied under high pressure, in wrought-iron cylinders, to consumers. GAS.

THE BAHIA GAS COMPANY'S MEETING.

SIR,—In the report of the meeting of the Bahia Gas Company, published in the last number of the JOURNAL, there are some remarks made by a Mr. A. F. Wilson, with which I do not altogether agree.

If it were merely a question of personal identity, I should not consider the matter of sufficient importance to take up space in your columns with a disclaimer; but the tenor of the remarks have a decided bearing on the confidence with which English capital may be invested in foreign enterprises, and they may have an effect on the minds of authorities, especially in Brazil, with whom Englishmen at the head of these enterprises are brought in contact.

I wish, therefore, to state that I am not the A. F. Wilson alluded to, and that in my ten years experience of the country mentioned—although I certainly avoided having recourse to law in every case where I could otherwise maintain my rights; and even in many instances considered it better to cede something by a compromise, rather than go to the trouble and expense of a lawsuit—I did not hesitate, on more than one occasion, and as an *extreme* measure, to appeal to the law of the country; and, while on these occasions I was invariably successful, I have much pleasure in testifying that I believe judgment was always fairly given on the merits and law of the case, without bias either on account of the nationality of the litigants or other influences.

I am, however, citing only my individual experience. I do not say that influences—especially political—are *not* sometimes used; but I would not hesitate to defend my rights in Brazil by the laws of the Empire—if I felt clearly satisfied that a good case existed, and other means of conciliation had failed.

34, *St. George's Road, London, Nov.* 15, 1879. A. FAIRLIE WILSON.

Legal Intelligence.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

WESTMINSTER, FRIDAY, NOV. 14.

(*Before Lord Chief Justice* COLERIDGE, *and Lords Justices* BRAMWELL *and* BRETT.)

BRAIN *v.* MARFELL.

This case was an action for breach of contract on the part of the defendant in permitting an interruption of the flow of water from a spring in his land to the house of the plaintiff. The plaintiff and the defendant are owners of land adjoining each other, in the parish of Hope Mansell, in Herefordshire, and the spring or well in question was situated in the defendant's land, about 40 yards from the boundary fence. The plaintiff, having no good spring on his own land, and the spring not being used by any one, had in the year 1867 obtained leave from the defendant's father, who was then the owner of the defendant's land, to lay down a pipe conveying the water from the spring to the plaintiff's house. After the death of the defendant's father in 1869 the defendant refused to permit the plaintiff to continue to use the pipe and spring without paying some compensation for the right, and, accordingly, after some negotiations, a formal agreement was entered into by the plaintiff and the defendant, whereby the defendant agreed to sell to the plaintiff, for the sum of £20, the well or spring in question, and the sole right to the water therein, with the right to conduct the water to the plaintiff's house for ever, "the intent and meaning of the parties being that the plaintiff should be absolutely entitled to the well or spring rights and premises unconditionally, and without any denial, interruption, disturbance, claim, or demand whatsoever of the defendant, his heirs or assigns, or any other person or persons whomsoever." Under this agreement the plaintiff enjoyed the flow of water from the spring until the year 1874, when the making of the Forest of Dean Railway was commenced. A triangular piece of land close to, but not touching the spring or pipe was conveyed by the defendants to the Railway Company for the purposes of the railway. A tunnel was made by the Company through this piece of land, and in the construction of the tunnel a shaft was sunk from the surface of the land to the tunnel. The making of the tunnel and shaft caused the spring to become dry. The plaintiff then brought this action against the defendant for damages for breach of the contract in permitting an interruption of the flow of water from the spring. The action was tried, without a jury, before Baron Pollock, who gave judgment in favour of the defendant. The plaintiff appealed.

Mr. J. J. POWELL, Q.C., for the plaintiff, contended that the defendant had broken the contract by conveying land to the Railway Company, which had enabled them to interrupt the flow of the water from the well.

Lord COLERIDGE pointed out that the flow of the water from the spring had not been interfered with. The water had been diverted before it reached the well. The case of *Chasemore and Richards*, in the House of Lords, had decided that there was no right of action by one landowner against another for the diversion of water percolating underneath and through the soil, but only for an interference with the visible outward flow of the water in a defined channel.

Mr. POWELL distinguished the present case on the ground that here there was a definite agreement that the plaintiff should enjoy the flow of water without interruption. It did not matter where that interruption occurred.

Lord COLERIDGE observed that *Chasemore and Richards* decided what rights in water were known to the law. A right to water percolating through the ground was not recognized by law.

Mr. LAWRENCE also argued in support of the appeal that the water which came into the well was obstructed by draining laterally into the tunnel, and that the terms of the agreement gave the plaintiff larger rights than were enjoyed by the plaintiff in the case of *Chasemore and Richards*. He urged that a boring by the defendant within a yard of the well, or under it, would have been a breach of the agreement.

Mr. S. O. GRIFFITHS, Q.C., and Mr. SELF, who appeared for the defendant, were not called on.

Lord COLERIDGE, in affirming the decision of the learned Baron, said that it was not necessary to decide whether the Railway Company were assigns of the defendant within the meaning of the agreement. Assuming that they were assigns in that sense, he was of opinion that neither the defendant nor his assigns had done anything in contravention of the agreement. It had been decided that there was no right of action by one landowner against another unless there was an interference with some defined flow or stream of water. It might be said that, though that was the ordinary common law right, the adjoining owners might extend or diminish their rights by contract. The question was whether the agreement in the present case had given the plaintiff a more extended right than usual. He could not find in the agreement any words capable of supporting the construction which the learned counsel for the plaintiff had sought to put upon it. In an ordinary conveyance of a spring with water flowing from it, the spring-head with the defined stream of water flowing from it was meant. That was all that was to be conveyed in the present case, and there was nothing in the words of the agreement to include the extraordinary right of preventing the defendant from interfering, by means of subterranean operations, with the water before it formed the spring-head. There were no such words, and they ought not to be introduced, for such a right was not contemplated by the parties. It had been argued, with some truth, that such a construction might cause a hardship to the plaintiff, for the defendant might have sunk a well close to the spring, and drained off all the water from it. But an agreement could not be tested by extreme cases, for an equally hard case might be put on the other side if the construction contended for by the plaintiff were adopted. If the defendant built a house anywhere on his land, and wished to sink a well for draining water, he might be unable to do so, because it would have the effect of diminishing the flow of water from the spring.

Lords Justices BRAMWELL and BRETT were of the same opinion.

Judgment accordingly.

LIVERPOOL POLICE COURT.—SATURDAY, NOV. 8.

(*Before Messrs.* E. BANNER *and* J. G. LIVINGSTON.)

ILLEGAL USE OF GAS.

Henry May, a painter, of 55, Chatham Street, Liverpool, was summoned for illegally using gas, the property of the Liverpool United Gaslight Company.

From the evidence it appeared that the Company's officers disconnected the meter in defendant's house on the 30th of January last, as he had omitted to pay the necessary deposit. On the 13th of June the meter

was taken away, and on the 25th ult. gas was seen burning in the house. An inspector visited the house, and found gas burning in several of the rooms, a connection having been made with the ground-pipe without the gas passing through a meter.

Defendant admitted the offence, and said his son had made the connection.

Mr. BANNER, in fining the defendant £5 and costs, which he directed to be paid to the Company, remarked that this was the most impudent case that had ever come within his knowledge.

Miscellaneous News.

METROPOLIS GAS SUPPLY.

PROPOSED APPLICATION TO PARLIAMENT TO AMEND THE PENALTY CLAUSES OF THE CHARTERED GAS COMPANY'S ACT OF 1876.—At the meeting of the Metropolitan Board of Works, last Friday, Mr. Cook, the Chairman of the Special Purposes and Sanitary Committee, moved—"That the Board do issue the necessary notices of its intention to apply to Parliament, either separately or in conjunction with the Corporation, for an amendment of the penalty clauses of The Gaslight and Coke Company Act." He said that at present these clauses made it necessary to know the works from which the gas in default was supplied, the fine being inflicted according to the make at the works; but in consequence of the amalgamations which had taken place with the Company, it was not possible to determine the station at which the defective gas was manufactured. The alteration proposed was, in effect, that if defective gas were supplied, a certain stated fine should be inflicted, irrespective of the works at which the gas was made. Some opposition was shown to the proposal, one member stating that he did not think it expedient to go to Parliament on so small a matter, especially considering the probability of a dissolution; and the motion was, on a division, rejected by 17 votes to 12. The Corporation have, however, given notice of a Bill to effect the proposed alteration.

The following is Dr. Whitmore's report on the illuminating power, pressure, and quality of the gas as supplied by The Gaslight and Coke Company in the parish of Marylebone during October:—

October.	Illuminating Power in Sperm Candles.			Mean Pressure in Tenths of an Inch.		Mean Quanty. of Sulphur in 100 Cu. Ft.	Mean Quanty. of Ammon. in 100 Cu. Ft.	Sulphuretted Hydrogen.
	*Mean of 24 Obser.	Highest.	Lowest.	Highest.	Lowest.	Grains.	Grains.	
Common gas	16·66	17·61	15·70	27·76	9·96	12·20	0·13	No trace
Cannel gas	20·48	23·21	19·00	25·55	12·61	11·23	0·20	No trace

Mean of daily readings of barometer . . . 29·91
" " " thermometer . . . 59·74

* Each observation consists of ten readings of the photometer, at intervals of one minute.

The mean illuminating power of the common gas during the month of October was equal to 16·66 sperm candles; it ranged between 15·70 and 17·61 candles. Once only was it slightly below the legal standard. The mean light of the cannel gas was equal to 20½ candles; it ranged between 19 and 23·21 candles. Six times it fell below the legal standard. The mean amount of sulphur found in 100 cubic feet of both gases was very low, and of ammonia but little more than a trace. The pressure of both gases was fair, and on no occasion was sulphuretted hydrogen detected by the ordinary tests.

METROPOLIS WATER SUPPLY.

The Registrar-General publishes the following table in reference to the water supply of London during October. According to the returns furnished to him by the Metropolitan Water Companies, 134,868,556 gallons, or 612,770 cubic mètres of water (equal to about as many *tuns* by measure, *tons* by weight), were supplied daily; or 236 gallons (107·2 decalitres), rather more than a *ton* by weight, to each house, and 33·2 gallons (15·1 decalitres) to each person, against 34·6 gallons during October, 1878.

Companies.	Number of Houses, &c., supplied in Oct., 1878.	Number of Houses, &c., supplied in Oct., 1879.	Aver. Daily Supply of Water in Gallons* during Oct., 1878.	Aver. Daily Supply of Water in Gallons* during Oct., 1879.
Total supply	551,972	571,608	135,676,172	134,868,556
From Thames	260,472	273,473	68,244,356	68,879,547
" Lea and other Sources	291,500	298,135	67,431,816	65,989,009
THAMES.				
Chelsea	29,152	29,945	8,157,100	8,424,200
West Middlesex	51,251	53,312	9,898,593	10,316,567
Southwark and Vauxhall	81,829	88,099	24,539,091	24,469,462
Grand Junction	38,462	39,648	11,455,529	11,792,418
Lambeth	59,778	62,469	14,194,043	13,876,900
LEA AND OTHER SOURCES.				
New River	127,577	129,271	28,878,000	28,113,000
East London	117,084	120,459	29,710,000	29,852,000
Kent	46,839	48,405	8,843,816	8,024,009

* Including that for manufactures and for various purposes other than for domestic consumption.

Note.—The return for October, 1879, as compared with that for the corresponding month of 1878, shows an increase of 19,636 houses, and a decrease of 807,616 gallons of water supplied daily. The return from the Southwark and Vauxhall Company shows an increase of 6270 houses, and a decrease of 69,629 gallons supplied daily, compared with the return for October, 1878.

The following is Dr. Frankland's report on his analyses of the water supplied to London during October:—"Taking the average amount of organic impurity contained in a given volume of the Kent Company's water during the nine years ending December, 1876, as unity, the proportional amount contained in an equal volume of water supplied by each of the Metropolitan Water Companies, and by the Tottenham Local Board, was—Colne Valley, 1·2; Kent, 1·6; Tottenham, 1·6; New River, 2·6; Lambeth, 3·4; East London, 4·0; West Middlesex, 4·1; Grand Junction, 4·3; Southwark, 4·6; Chelsea, 5·0. The Thames water supplied by the West Middlesex, Southwark, and Grand Junction Companies was of nearly the same quality this month as in September, but that delivered from the same source by the Chelsea and Lambeth Companies had improved, the Lambeth water not only surpassing all the other Thames waters, but even the water of the Lea delivered by the East London Company. The Lea water, distributed by the New River Company, was much superior to the best sample of Thames water, but that abstracted from the same source by the East London Company was only very slightly better than average Thames water. All the water abstracted from these rivers was efficiently filtered before delivery, but that of the New River Company contained filmy particles of carbonate of lime. The deep well water delivered by the Kent and Colne Valley Companies and by the Tottenham Local Board of Health was, as usual, of excellent quality for dietetic purposes. The Colne Valley Company's water had been softened by Clark's process, and was therefore suitable for washing. Seen through a stratum two feet deep, the waters presented the following appearances:—Kent, Colne Valley, and Tottenham, clear and colourless; Chelsea, West Middlesex, Southwark, Grand Junction, and East London, clear, very pale yellow; Lambeth, clear, nearly colourless; New River, nearly colourless, slightly turbid."

Results of Analyses expressed in Parts per 100,000.

Companies or Local Authorities.	Total Solid Matters.	Organic Carbon.	Organic Nitrogen.	Ammonia.	Nitrogen, as Nitrates and Nitrites.	Total combined Nitrogen.	Chlorine.	Total Hardness.
Inner Circle.								
Thames—								
Chelsea	30·08	·270	·027	0	·176	·203	1·4	19·1
West Middlesex	31·58	·223	·026	0	·220	·246	1·4	19·1
Southwark	31·64	·241	·038	0	·236	·274	1·4	20·0
Grand Junction	30·76	·223	·030	0	·219	·249	1·4	19·4
Lambeth	33·02	·176	·023	0	·283	·306	1·5	20·6
Lea—								
New River	30·16	·135	·021	0	·257	·278	1·5	19·1
East London	31·48	·215	·024	0	·186	·210	1·6	20·6
Deep wells—Kent	45·72	·081	·014	0	·453	·467	2·6	28·1
Outer Circle.								
Colne Valley	13·88	·059	·009	0	·408	·417	1·5	6·7
Tottenham Local Board	40·44	·087	·011	0·72	0	·070	2·9	25·0
Corporation of Birmingham*	25·78	·197	·034	·002	·264	·299	1·9	16·2
Corporation of Glasgow†	3·06	·150	·028	0	·007	·035	0·60	1·18

* Analyzed by Dr. Alfred Hill, Medical Officer of Health and Analyst to the Borough.
† Analyzed by Dr. E. J. Mills, F.R.S., of Anderson's College, Glasgow.

Note.—The numbers in the analytical table can be converted into grains per imperial gallon by multiplying them by seven, and then moving the decimal point one place to the left. The same operation transforms the hardness in the table into degrees of hardness on Clark's scale.

The following is Dr. Whitmore's report on the composition of the water supplied to Marylebone during October:—

October.	In Grains, per Gallon.							In Parts, per Million.		In Degrees.	
	Total Solid Matter.	Loss by Incineration.*	Chlorine.	Equal to Chloride of Sodium	Nitrogen as Nitrates and Nitrites.	Oxygen required for Oxidizable Matter.	Estimated Organic Matter.	Free Ammonia.	Albuminoid Ammonia.	Hardness.	Hardness after Boiling Fifteen Minutes.
West Middlesex	22·60	0·98	1·10	1·81	·102	·046	·368	·00	·08	15·3	4·3
Grand Junction	22·40	0·98	1·12	1·84	·105	·041	·328	·01	·08	15·2	4·4
River Thames at Hampton	24·00	1·32	1·08	1·77	·116	·071	·568	·03	·20	16·5	5·3

Temperature of West Middlesex water as drawn from the main . 52° Fahr.
Temperature of the water taken from the River Thames . . . 53° Fahr.
Temperature of the Grand Junction water as drawn from the main 53·5° Fahr.

* The loss by incineration represents the amount of organic and other volatile matters contained in the imperial gallon (70,000 grains) of water. The total solid matter, *minus* such loss, consisted chiefly of carbonate of lime, with small quantities of other equally harmless salts.

The water of both Companies, as seen through a stratum two feet thick, was clear and bright; that taken from the River Thames at Hampton was slightly turbid.

SOCIÉTÉ TECHNIQUE DE L'INDUSTRIE DU GAZ EN FRANCE.

PRIZE COMPETITION FOR 1880.

The Committee of the above Society announce that the following sums will be awarded in prizes at the Annual Meeting in 1880:—

1.—A sum of 4000 francs (£160), in prizes of various amounts, to the authors of the best papers on any subject connected with the gas industry. The number and value of the prizes will be determined according to the importance of the papers deemed worthy of the award.

2.—A sum of 1200 francs (£48) to be divided between the authors of the two best papers written for, and presented at the Annual Meeting in 1880.

3.—A sum of 200 francs (£8) to be given to the foreman or workman recommended for the longest and best service in gas-works.

All persons, whether Frenchmen or foreigners, Members of the Société Technique or not, are eligible to compete for the prizes in the first group. Those in the second are restricted to Members of the Society. The qualifications of the competitors for the third prize must be indicated and certified by the Managers or Superintendents of the works in which the candidates are employed, and must be sent to the offices of the Society, 9, Rue de Provence, Paris, before April 1, 1880.

The papers must be unpublished productions, and written in French; they must each bear a motto, which must also be written upon a sealed envelope containing the name of the author. The papers, with the accompanying envelopes, must be sent to the offices of the Society, as above, before May 1, 1880. The prize papers will be published in the Society's Annual Report. The MSS. will not in any case be returned to the authors, but will become the property of the Society, and be deposited in their archives.

The prizes will be awarded by the General Committee upon the report of a commission of five members nominated by them, and the awards will be made in general meeting.

MR. DENNY LANE, Barrister-at-Law, Secretary of the Cork Consumers Gas Company, will again offer himself as a Nationalist candidate for Cork city at the forthcoming general election.

AT a meeting of fire-brick manufacturers, held at Stourbridge on the 4th inst., it was unanimously agreed to advance the prices of fire-bricks 5s. per 1000, cement clay 1s. per ton, gas-retorts 6d. per foot, and all other goods 10 per cent.

AMERICAN GASLIGHT ASSOCIATION.

The Seventh Annual Meeting of this Association was held at Philadelphia, Pa., on Wednesday, Thursday, and Friday, Oct. 15, 16, and 17, and from the "Official Report," which appears in the *American Gaslight Journal*, we extract the following particulars:—

The chair was taken on Wednesday, Oct. 15, by Mr. W. H. PRICE, of Cleveland, Ohio, one of the Vice-Presidents, the President (General Roome) being unavoidably absent.

The minutes of last year's proceedings having been printed, were taken as read; and it was agreed to send a telegram to General Hickenlooper, of Cincinnati, one of the Committee, congratulating him on his election to the position of Lieutenant-Governor of Ohio.

Twenty-four applications for membership were submitted and accepted, and three additional ones were received.

The PRESIDENT then delivered the following

INAUGURAL ADDRESS.

Gentlemen of the American Gaslight Association,—When you convened, one year ago, in annual session, a dark pall lay upon the business interests of the American people. In September, 1873, a great change came. Manufacturing, building, trading, speculating, all culminated, and the immutable laws of trade asserted themselves in a destructive reaction. Widespread financial disaster followed, and continued for several years. Every department of industry was subjected to its paralyzing influence. None had grown more rapidly during the preceding period of personal and municipal extravagance than that which you represent, and few suffered more during the years of enforced economy. To-day we have met under brighter auspices. The pall has been lifted; the wheels of industry are moving; trade is distributing with busy hands the products of farm and factory; confidence has returned; in the slang phrase of the politician, business is "booming." Aside from any personal and professional considerations, it is matter for joyous congratulation that there is employment for every hand, for every muscle, for every brain; that labour and capital may go forward hand in hand, each employed and each well paid. Gentlemen, our seventh annual meeting is held under the most agreeable circumstances. But we have not met for rejoicing and merry-making, but to realize the practical purposes of our organization. We have come together to compare experiences, to compare practices, to compare results, hoping that we may gather from the mass of our experiences and practices that which will be most useful, and, therefore, most valuable.

At the outset, it seems eminently proper to inquire what is the present condition of the gas interest in this country. That it is a large interest I need not say. It ramifies every section of our widely-extended domain, and employs in its operations hundreds of millions of capital, and many thousands of men. For several years this interest has been subjected to a severe ordeal—the competition which has arisen from the discovery of petroleum in large quantities, the progress made in the art of refining it, and the invention of lamps adapted to its use. These facts, together with another—namely, the very low price to which this natural illuminant has declined, have operated powerfully against the gas interest in many cities, and perhaps to some extent in all places where illuminating gas is made and sold. In some the use of gas has fallen off, it is said, as much as one-third; but this is exceptional. I have no doubt the interference of oil with gas has been much assisted by the hard times experienced within the past few years. Necessity knows no law—and many have discontinued the use of gas because, during the hard times, they could not pay for it. I fear it must also be said that in some instances a high rate charged for gas, illiberality in the extension of mains, and an unhappy manner of dealing with customers—sometimes one, sometimes the other, and sometimes all these causes have combined to alienate business, and depress the gas interest. So far as I have observed, those who have been burning gas do not willingly relinquish its use and take petroleum; but they are impelled by some strong influence when they make that change; and I have also noticed that when that influence has been removed the use of gas is gladly resumed.

That petroleum, in some of its forms, is, in one view, cheaper than gas, even where gas is sold at a low price, is no doubt true. A family may, at a low cost, manage to light its dwelling, for ordinary purposes, by the use of petroleum; but the light is not so convenient, not so safe, and not so pleasant as gaslight. A place of business may be lighted by petroleum at a less cost, perhaps, than by gas; but every one knows that the saving in cost is at the expense of convenience and cheerfulness. That petroleum light is really, volume for volume, cheaper than gas, when sold at a moderate price, may well be doubted. I do not believe it is. The truth is, no article of domestic consumption is so injudiciously used as gas. Men allow the decorator to cover their walls with fashionable paper, which bears upon its face colours so dark that nearly every ray of the best light is absorbed, and then complain that the gas is poor. I have seen rooms thus decorated that the sun in all his glory could hardly light. The modern church chandelier, with its multitude of small burners, is another specimen of the way not to do it. Gas enough is burned in a church so supplied to light it beautifully, but it is so subdivided that the combustion is very imperfect, and the place is gloomy; whereas, if the same, perhaps less, gas were burned with suitable fittings, the illumination would be splendid. Many a room would be better lighted with one large burner than it is with four, and at much less cost.

These statements are intended to illustrate one of the difficulties the gas manager has to contend with. If the consumer could be taught to use gas judiciously, a large part of the trouble with petroleum would disappear. Here is a field where "reform is necessary." Can this Association do anything to bring about such a reform? I fear the work will be slow, but I think a good deal may be done, and hope some attention will be given to this matter during the sessions before us.

Since we last assembled in annual convention, the agitation for cheaper gas has gone on, and, in some cases, has become intense. In many cities the municipal authorities, desirous of reducing taxation, have been most importunate in demanding a reduction in the cost of public lighting; and when gas companies have declined to yield to this demand, lighting with gasoline has sometimes been substituted for that by gas. Here, then, is another point of collision between the gas interest and its antagonist petroleum.

I am forced to believe that the question of the hour with gas managers is this—"How can we reduce the cost of gas?" By cost, I mean the cost to the manufacturer; and in the cost I include material, labour, repairs, general expenses, use of capital, depreciation, and risk. The people demand good light at lower rates; and the practical question with every gas manager is—What can I do in the way of economy, in the way of increased production, in the way of diminished expenses, that shall enable my company to meet this demand, and, at the same time, secure to my stockholders fair remuneration?

To the practical solution of all that is involved in the foregoing, every earnest gas manager will give heed; and, with your indulgence, I will offer a few leading suggestions indicating my own view of the way to do it.

In my judgment, the very first step to be taken by any gas manager who wishes to be in a position to sell his product at a moderate figure, is to put and keep his works in the best possible productive condition. This by no means implies the acquisition and the application of every patented contrivance which enthusiastic inventors and greedy vendors may urge upon his attention. The prudent manager will be slow to expend the money of his stockholders upon new-fangled schemes, however specious, or however highly recommended. He will undoubtedly be glad to accept and use any new system, or any new device, which, after thorough trial, has been proved to be really valuable. The best possible productive condition implies such retorts—as regards size, shape, and weight—as experience has proved to be at once most durable and most effective. It implies such settings as the same teacher has shown to be best adapted to the maintenance of the integrity of the bench, and the most economical application of fuel. This condition also includes such condensing, scrubbing, and purifying appliances as the same test has demonstrated to be both efficient and economical.

The great point to be first attained is to put your gas into the holder at the lowest possible cost. To do this there must be thorough economy of material. You must obtain from your coal the largest possible yield of gas, with the use of the smallest quantity of fuel and labour. I do not undertake to say how many cubic feet of gas should be obtained from a pound of coal, nor exactly what quantity of fuel should be used, nor how much labour should be applied. I think there are gentlemen here who possess valuable information on these points, and I also think the Association ought to have the benefit of this information. It may be well known to all that great progress has been made in reducing the amount of fuel required for carbonizing. I was emphatically told by the Engineer of a works in Paris, which I visited in June last, that the quantity of coke required for carbonizing the coal used there did not exceed 15 per cent. of the amount made in his works; and I presume the statement was correct. I may also say that the amount of labour required for firing was, in the same establishment, reduced to a minimum. It is not my purpose to advertise any of the several plans which are in use for reducing the quantity of fuel requisite, and the labour necessary for its application. Nor do I feel qualified to decide which is best. My impression is strong that, while each has its merits, there may be selected one which gas managers will find of great use in reducing the cost of their gas.

You are well aware that much talent and labour have been expended in producing machines for the saving of toil in drawing coke and in charging retorts—two points where it is desirable to reduce the cost and diminish the severity of the work. I think, until recently, but little success has resulted from this expenditure. I know that I am treading on delicate ground, but I trust I shall be pardoned for calling your attention to the invention of a gentleman of Cincinnati, which I have but lately seen in operation, and in reference to which, conservative as I am, I cannot but cry "Eureka!" I made a trip to Cincinnati on purpose to see Mr. Ross's drawer and charger in service at the works of the Cincinnati Gaslight Company. Both machines seemed to me to do their work perfectly. They are not expensive, not intricate, not easily damaged or broken, and I was assured by the Superintendent of the works, who has for some time had them under his eye, that the two, operated by three men—not skilful engineers, but such as may be had for 1·50 dols. per day—will draw the coke from, and charge 25 benches, of six retorts each, every four hours. The maximum may be 30; the minimum cannot be less than 20. This does not include taking away and caring for coke, nor does it include firing of arches. Each practical manager can compute for himself the saving which would be made in his works, were they so adjusted that 15 per cent., or even 25 per cent. of the coke made would do the carbonizing, that one man could fire for 20 benches, that three men with two machines could draw the coke from, and charge 25 benches, and that two additional men would quench and take care of the coke from the same 25 benches. I venture the prediction that the day is near when these things will come to pass. Of course, I only speak in reference to large works. I may also say that the realization of this anticipation implies, in most cases, a good deal of change in the arrangement and the structure of retort-houses. Should what I have predicted be realized, each manager can estimate approximately how much the total cost of each 1000 cubic feet of gas will be reduced. I ought to add that I do not ask any one to take my opinion in regard to these matters, but hope that each and all interested will give the subject personal examination.

The second step necessary to the end I have mentioned is to see that your distributing mains and all your service-pipes are as nearly tight as human skill and care can make them. Do not allow the illuminating product of your works to waste into the ground through leaky pipes. It will make a large difference in results if you lose only 5 per cent. of your make of gas instead of 15 to 25.

The next step, after having put the works and distributing department in "tip-top" order, is to purchase only the best material. Gas companies are considered good customers, because they use largely and pay promptly; hence they are beset by coal dealers to buy. Now, there is a great deal of poor coal offered to gas managers, and urged upon them by ingenious importunity. I have known the offer to be accompanied by tempting appeals to the cupidity of the purchasing agent. I trust every such agent is proof against those appeals, and that if he does not kick the tempter out of his office, he does at least say emphatically, "Get thee behind me, Satan!" However this may be, in one way or another, by some means a large amount of poor coal is annually carbonized. This mistake is serious, for thereby comes meagre production of gas, poor coke, large expenditure of fuel, labour, retorts, and other apparatus. I had almost said that a fair profit may be wasted in the use of poor coal. I will say that mismanagement at the works may mar the success of a company otherwise well managed.

The fourth point is the application of labour. Employ just enough—neither too little nor too much. Have a place for every man, and keep every man in his place. Make everybody count. Have no deadheads, no sluggards.

The fifth step is close and thorough accountability. Sometimes a man wins the confidence of his employers, and sadly abuses it. I know a case in point. A man of honest appearance held the position of coke-yard master. He superintended the delivery of coke upon orders issued at the office. After years of service he was discharged because it was discovered that he was largely over-delivering. He had been doing so for a long time, so that thousands of dollars had been lost to the company employing him. His detection came at last, through the careful manner in which the superintendent kept his carbonizing book. The care and management of residuals is, as you all know, a most important element in the matter we are considering. Our English friends have largely the advantage of us in the value of everything in the way of residual products. Cannot the gas manager in our country do something more effective than heretofore in this department? The subject is worthy of our careful study.

There is another method by which the cost of gas may be indirectly reduced. I refer to the extension of its use in cooking and heating, and for driving engines. The apparatus for manufacturing and distributing gas being given, an increase in the production may be made at a small cost

except for material and labour. In other words, as the quantity is increased, the cost of the whole is relatively diminished. And it is especially desirable to increase the demand for that gas which will give employment to our works, including mains, by day and in summer. If gas-engines were generally in use for light manufacturing, as they might be, the demand would be mainly by daylight, and would continue in summer. Now our mains earn little by day and in the warm season. Something has been done, but only a little. I am sure there is in the department just mentioned a wide field for gas companies, and it should be occupied.

Thus, gentlemen, I have suggested, in a hurried manner, a few of the points where I think improvement may be made. I have said nothing in regard to the conduct of the gas business at the head office. It is not needful to say that the same economy, the same careful management should prevail in the conduct of the office, where the bills are made out and collected, as at the works. Every needlessly irritating rule should be either abolished or modified, and, in dealing with consumers, kindness, patience, and politeness should invariably rule.

In what I have said I have not aimed to be original, but only to be practical. I have entire faith in the permanence of our business, and I believe there is a brilliant future, in more than one sense, for illuminating gas; but I also believe that, to be eminently successful, we must meet the demands of the hour, and meet them manfully and liberally.

At the conclusion of the address, Mr. DENNISTON submitted the report of the Executive Committee, which contained various recommendations as to alterations in the Articles of Constitution. Among the principal changes were the following:—It was agreed that "any member whose dues shall remain unpaid for a term of three years may be dropped from the roll by the vote of the Executive Committee;" and that "no member who shall be two years in arrears shall be entitled to vote, or to participate in the deliberations of the Association;" also that two copies of the annual report should be furnished to each member. The salary of the Secretary and Treasurer was fixed at 300 dols. per annum, a proposal to make it 400 dols. not being adopted. The part of the report which gave rise to most discussion was the recommendation that the Officers of the Association should assume office immediately after their election, instead of, as the Article stood, "after the close of the meeting at which they are elected." It was eventually agreed to leave the Article as it was. A change was, however, made in reference to the Officers, to provide for their retirement by rotation, it being resolved "that a change of at least one Vice-President, one member of the Finance Committee, and two members of the Executive Committee, be made at each annual meeting of the Association."

The following gentlemen were then constituted the Committee on Nominations of Officers for the ensuing year:—Mr. A. C. Wood, Mr. G. Dwight, Mr. W. A. Stedman, Mr. P. T. Burtis, and Mr. T. Forstall.

Captain WHITE said that he was authorized by General Roome to state that under no possible circumstances was he a candidate as President of the Association. He desired his personal thanks to be presented to the members of the Association for the honour they had conferred upon him in choosing him to fill the position of President for so many years, but he at the same time desired to state peremptorily that he would not serve in that capacity again, believing that it barred the promotion of other gentlemen to the office.

Mr. NETTLETON also announced that he was not a candidate for the office of Secretary and Treasurer for another year.

The report of the Treasurer showed that there was brought into last year's account a cash balance of 624·60 dols.; received for initiation fees, 130 dols.; received for annual dues, 747 dols.—total, 1501·60 dols. Against this there were disbursements of—Expenses of meeting in 1878, 60 dols.; salary of Secretary and Treasurer, 300 dols.; postage, printing, &c., 43·75 dols.; leaving a balance to carry forward of 1097·85 dols. There were 6 honorary and 193 active members.

In connection with this report, Mr. NETTLETON said that he thought it would be interesting to the Association to have a sort of review of the past financial history of the Association; and so he went over the books, commencing with the year 1873–4, as prior to that time there was no record which would furnish exact data. For the year 1873–4 there was received by the Association, composed then of 60 members, for initiation fees 600 dols., and for annual dues 5 dols. each from 14 members, showing that this was merely the commencement, or substantially the commencement of the organization. The total receipts for the year 1873–4, were, therefore, 670 dols. For the next year, 1874–5, there were 32 initiation fees received, and 63 members paid their annual dues. In the year 1875–6 there were 33 initiation fees paid, and 114 members paid their annual dues. For the year 1876–7 there were 20 initiation fees paid, and 151 members paid their annual dues. In 1877–8 there were 16 initiation fees paid, and 147 annual dues. In the year 1878–9, before the 30th of September, there were 13 initiation fees, and 149 annual dues. Since the 30th of September there had been paid annual dues to the amount of 110 dols. There were 28 members liable to pay annual dues which were unpaid at the commencement of the meeting.

The report of the Finance Committee (Messrs. J. R. Chambers and J. P. Harbison) was next received; as also the report of the Committee—consisting of General Roome and Captain White—appointed to arrange for the printing of the last annual report.

The following report of a Committee formed to investigate the subject of Unaccounted-for Gas was then read:—

"To the American Gaslight Association.

"Gentlemen,—Your Committee, to whom was referred the subject of Unaccounted-for Gas, and a method by which the same could be reported by the various companies in an equable manner, would most respectfully report that it was impossible to get all the members of the Committee together; but a majority of the same had several meetings, and used their utmost endeavours to make a full and final report on the subject, but we regret to say were unable to adopt any method which, whilst being simple of application, should be equally fair to all companies.

"The only system that could be in any way considered as likely to come within the scope of the above was that of taking some one diameter of pipe as a standard diameter, and raising or lowering all others to that standard. This presented these difficulties:—

"1. That it necessitated the preparation of a large number or series of formulæ for the purpose of bringing the various sizes of pipes to the adopted standard.

"2. The necessity of some method of reaching an average pressure.

"3. That even after the formulæ had been constructed, and the pressure regulated, there yet remained the fact of the difference in the number of services per mile of main, requiring to be worked out and equalized by proportion.

"The idea of adopting some one diameter—such as 6 inches or 8 inches—to be a standard is certainly a feasible one, as formulæ can be prepared and furnished to the engineers of the various companies, which would require of them but a few moments labour to bring their mileage of different sizes to a mileage of standard diameter, providing that all the companies used the same average pressure; but there are few companies that are so situated, consequently requiring the construction of a series of formulæ for the various averages of pressure. The construction of such formulæ overcomes the second difficulty, and the third is easily disposed of by simple work in proportion.

"If the Convention deems that the steps already taken are in the right direction, or that the above propositions, when completed, would be of any advantage or value to the Association, we should only be too happy to continue the investigation and complete the necessary formulæ.

"(Signed) { CLEMENT A. WHITE, A. C. WOOD."

On the motion of Captain WHITE, the Committee were continued, and requested to make further investigations, and report at the next annual meeting.

(To be continued.)

SOUTHERN DISTRICT ASSOCIATION OF GAS ENGINEERS AND MANAGERS.

The Annual General Meeting of this Association was held at the Guildhall Tavern, Gresham Street, E.C., on Thursday last—Mr. JOHN WEST, of Maidstone, in the chair.

The minutes of the last meeting having been read and confirmed, the following gentlemen were elected office-bearers for the ensuing year:—

President.—Mr. J. Hunter, Woolwich.

Treasurer. — Mr. A. H. Wood, Hastings.

Secretary.—Mr. J. L. Chapman, Harrow.

Committee.

Mr. C. E. Botley, Wormwood Scrubbs.	Mr. C. Gandon, Sydenham.
Mr. R. W. Brett, Hertford.	Mr. D. F. Goddard, Ipswich.
Mr. W. R. Cooper, Banbury.	Mr. J. Wadeson, Windsor.

Auditors.

Mr. Charles Farrand, Croydon. | Mr. E. Price, Hampton Wick.

The following paper was then read by Mr. HARRY TOWNSEND, of Waltham:—

ON THE USE OF TALLOW FOR JOINTING GAS-MAINS.

The particular joint which I have the honour of submitting for your consideration to-day is by no means new, having been used almost exclusively for the last 30 years by the Great Yarmouth Gas Company, with whom I was connected for six or seven years; but with that exception it seems to be entirely unknown. It is thus described in the fifth edition of "Clegg's Treatise on Coal Gas," p. 286:—

"The usual elastic joint for gas-pipes is very much cheaper than the ordinary lead joint, and it possesses other advantages. The ordinary pipes are placed in the socket in precisely the same way as for a lead joint. Into the bottom of the socket there is caulked, to the depth of about 2 inches, white spun-yarn, well covered with putty; then at the lip of the socket, tarred gaskets are caulked in, of such a thickness that they will just fit into the annular space left between the pipe and the socket, and to such a depth that a space of about 1½ inches will be left between the two yarns all round the pipe. At the top of the socket, where the ends of the tar gaskets meet, a portion is drawn up to form a "gate," exactly in the same way as in running a lead joint. A mixture of two parts Russian tallow and one part of common vegetable oil is poured while warm into the "gate," when it will run into and fill up the space between the two yarns. As the mixture does not contract on cooling, and is quite impervious to the air, it forms an air-tight joint. Half a mile of 9-inch pipe, jointed on the above plan, has been found by the barometer to be perfectly air-tight when exhausted equal to a pressure of 24 inches of mercury."

Through the courtesy and kindness of my old superintendent, Mr. W. H. Willis, Engineer and Secretary of the Great Yarmouth Gas Company, I am able to give you his experience of a practical use of these joints, extending over a period of 30 years. He writes as follows:—

"Some miles of pipes jointed in this manner have now been laid in Yarmouth. In 1876 several hundreds of yards of pipes (laid with these joints in 1848) were taken up, and pipes of a larger diameter substituted. I carefully examined the joints before they were disturbed, and not one leaky one was found, but every joint appeared as perfect as on the day it was made. When some of the joints were drawn asunder the white lead looked quite fresh, and not in the least discoloured. Last year (1878) some 3, 4, and 6 inch pipes were taken up, and with the same result, every joint was as good and as tight as it was when made. These pipes were laid in 1850 and 1851. In some places, where there had been a settlement, the joints were found perfectly tight; but where ordinary lead joints were found under similar circumstances, many were leaky."

Such is Mr. Willis's experience of pipes jointed in this manner, laid underground. He also gives the following information respecting joints exposed to the weather:—

"A main, over the Suspension Bridge, was laid in 1849. The oscillation of the bridge is at times very considerable, but the joints of the gas-main have remained to this day perfectly sound and tight. This main has no covering, but is simply hung on brackets attached to the braces on the under side of the footpath, and is therefore exposed to the action of the atmosphere."

They have also been exposed for years to the action of salt water, and with the same result. Mr. Willis writes: "A short time since I saw some joints of a 6-inch main stripped; they were all quite perfect and sound, notwithstanding some of them had been exposed to the action of water for some time, and the soil for some length, I should think, was always wet at high water."

I think that you will allow that this testimony is conclusive as to the practical value of these joints. A joint which at the end of 30 years has proved itself sound, either when exposed to the action of the soil, or of the atmosphere, or of water, and which defies either subsidence or oscillation, is, I think, deserving of confidence.

I myself laid about 500 yards of 8-inch main with these joints in 1877 at Waltham Abbey. I stripped the main a few days ago, and tested the joints with a light under a pressure of 27-10ths, and found them perfectly tight.

But the strongest evidence I can adduce of the utility of these joints is that at Great Yarmouth, where 17 out of 20 miles of mains are laid with them, the unaccounted-for gas, including all that used on the works and offices, for meter-testing and all other purposes, is only 6·16 per cent., the sale per ton being 9845 cubic feet, or 93·84 per cent. of the make.

The other advantages claimed for this joint are its cheapness and its elasticity, which I will now endeavour to prove. Mr. Ellis, of Great Yarmouth, has kindly supplied me with the following table of the weights

and quantities of materials used for various-sized tallow joints, taken from actual working:—

Quantities of Materials per Joint.

Size of Main.	Spun-yarn.	Gasket.	Tallow.	Oil.	White Lead.	Red Lead.
In.	lbs.	lbs.	lbs.	Pint.	lbs.	lbs.
2	0·12	·05	0·07	·05	0·33	·02
3	0·34	·11	0·11	·06	0·35	·02
4	0·51	·18	0·18	·12	0·55	·03
12	1·37	·39	0·50	·37	1·64	·12
14	1·81	·43	0·56	·52	2·01	·13
20	2·51	·66 ·50 Tarred yarn.	1·39	Oil and tallow mixed.	3·54	White lead and oil mixed.

For the 20-inch joint the mixture was composed of 1 lb. of oil to 3 lbs. of tallow; and for the putty the following proportions were used:—28 lbs. of white lead to 8 lbs. of oil.

These quantities reduced to values give for the various-sized joints, for materials only, the following results:—

2-in. pipe	0s.	3½d. per joint.
3-in. „	0	5½ „
4-in. „	0	8½ „
6-in. „	0	11½ „
12-in. „	2	1 „
14-in. „	2	3 „
20-in. „	2	8 „

The corresponding cost of lead joints, taking the quantities from Mr. Newbigging's "Handbook for Gas Engineers and Managers," and valuing lead at £15 per ton, is as follows:—

2-in. pipe	0s.	3½d. per joint.
3-in. „	0	5½ „
4-in. „	0	8½ „
6-in. „	1	2 „
12-in. „	2	10 „
14-in. „	3	5 „
20-in. „	5	4 „

From this it will be seen that the relative cost of tallow and lead is as follows:—

2-in., 3-in., the same with either material.
4-in., tallow is 3 per cent. less than lead.
6-in., „ 17 „ „
12-in., „ 26 „ „
14-in., „ 34 „ „
20-in., „ 50 „ „

From this it will be seen that the larger the joint the greater the saving by the use of tallow instead of lead, and as the tallow joint requires no setting up, there is also a saving in labour by its use.

When the joint is completed, we usually paint it and the front of the socket with red lead, which adds a little to the cost—included, however, in the above prices—but gives it a very neat appearance.

If any proof were needed of the importance of elasticity in joints for gas-main, it would be readily furnished by the numerous contrivances which have been devised, and in many cases patented, for ensuring this object; but their costliness has hitherto prevented their general adoption. Now, in this joint we have flexibility without leakage, and at a cost considerably less than even the ordinary rigid lead joint.

To prove the elasticity of this joint, I made the following experiment:—I connected together three 8-inch pipes, and capped each end. I then removed the supports from beneath the two middle sockets, and weighted the centre pipe down until it formed an angle of 175° with each of the other pipes; or, in other words, until the centre pipe had sagged 8½ inches. I then connected these pipes to a small experimental gas-holder, and tested the joints under a pressure of 35-10ths, and found them perfectly tight. I left them in this position for seven days, and then tested them again, and with the same result. They were all perfectly tight.

Another advantage these joints possess over any other is, that where it is necessary to take up a main to replace it with a larger one, the pipes are very easily separated; no cutting is required, as they will draw with but little trouble, and are then perfectly uninjured, and fit for relaying in another situation.

Mr. Willis has devised some ingenious little machines for white-leading the yarns, but the plan which finds most favour with him is as follows:—The yarns are cut to the required length, and are then pulled through white lead thinned with oil in a trough about 13 in. by 9 in. by 4½ in. deep, furnished for convenience with a handle. On the side of this trough is fixed a bridge, or squeezer. The yarns, when properly saturated, are pulled through this squeezer with one hand, while with the other a piece of flat iron, with a slot in the end, is pressed down on the yarn, and the superfluous lead is squeezed out of it, and flows back into the trough. A short piece at the end of each yarn is left unleaded for hand-hold, and with a little dexterity on the part of the workman these yarns can be very expeditiously prepared without any waste, and without bringing the lead into contact with the hands.

An interesting discussion followed, and a cordial vote of thanks was given to Mr. Townsend for his paper.

It being Mr. West's last day for presiding over the Association, Mr. Gandon proposed—"That the best thanks of the Association be given to Mr. West for the interest he has taken in its affairs, and for the great courtesy he has shown to all the members while in the chair." This was seconded by Mr. Wood, and carried unanimously.

The proceedings then terminated.

The Christmas lectures, adapted for juvenile audiences, at the Royal Institution this year will be by Professor Tyndall, on "Water and Air;" while those at the Society of Arts will be given by Mr. W. H. Preece, on "Wonders of Sound" and "Wonders of Light." The dates for these lectures will be the 30th of December and the 6th of January.

Stockton and Middlesbrough Corporations Water Board.—The annual meeting of this Board was held last Wednesday, when it was agreed to serve notices forthwith on all parties emptying sewage into the River Tees. With regard to applying for a Provisional Order for additional powers, it was resolved that the Accountants and Secretary meet the South Stockton Local Board Water Committee, and supply them with such information as they consider necessary in order to enable them to advise the ratepayers of South Stockton as to the course they should pursue.

MALLET'S NEW HIGH-POWER GAS-BURNER.

At the Annual Meeting of the Société Technique de l'Industrie du Gaz en France, held at Lille in June last, and reported in the Journal for July 15, p. 104, M. Mallet, the President, presented a paper on some experiments made at Toulouse with a new gas-burner he had designed. The makers of the burner have sent a sketch and description of the apparatus to the *Journal des Usines à Gaz*, from which the subjoined particulars are extracted.

The advantages which characterize M. Mallet's new burner are the following:—

1. By the arrangement of the jets, there is an impingement of the flames, and consequently complete combustion of the gas.
2. The air does not arrive at the lower part of the flames, as in other burners, but only at a certain height determined upon.
3. Combustion takes place in a relatively confined space compared with the amount of gas consumed, and this is effected without the assistance of air currents conveyed by means of special pipes, which only complicate the arrangement of the apparatus, and, by becoming heated, raise the temperature of the air, and detrimentally affect the illuminating power of the gas.
4. The air on the one side, and the gas on the other, in traversing the pipes and jets, become heated, and thus attain the temperature most favourable for good combustion, which allows all the molecules of the gas to be utilized, and the greatest possible luminous intensity to be developed.

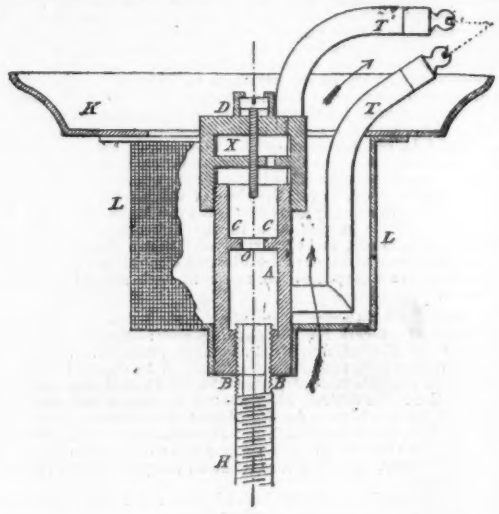


Fig. 1.

The above engraving (fig. 1), which represents a vertical section of the apparatus, shows the arrangement of the burners, marked T T. The burner consists of a tube, A, about an inch in diameter, when required to supply a ring of five bat's-wing burners, but varying in size according to the number of burners in the group. This tube is screw-threaded interiorly at its lower part, and exteriorly at its upper part. To the upper thread there is screwed a cap, D, which carries upon it five other burners, similar to those in the under ring, but varying in number according to the intensity of the light required. The central portion of the cap allows of the passage of a screw, which raises or lowers a disc or collar, X, pierced with a number of holes equal to the orifices leading from the upper portion of the cap, but alternated with them. This disc has upon the opposite extremities of its outer diameter two notches, which slide upon two guides fixed in the cap. A small hood placed above the screw prevents it from rising, although by its rotation it communicates an ascending and descending motion to the disc. When, in its ascent, the disc approaches the upper part of the cap, the passage of the gas through the holes in the disc necessarily decreases, and ceases altogether when contact takes place between the disc and the cap. By this disc, therefore, not only may the supply of gas to the upper burners be regulated and reduced, but it may be cut off entirely, and allowed to flow to the lower burners only.

Into the portion B B of the tube A there is screwed a supply-tube, H, which can rise in the tube A up to the diaphragm, C C, pierced in its centre with an orifice, O, which allows the gas to enter the upper part of the apparatus, at the same time completely blocking the lower burners, and allowing the upper ones only to be lighted.

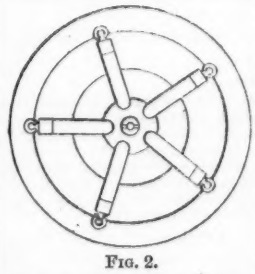


Fig. 2.

Fig. 2 is a representation of the under side of the cap, with its five gas-pipes. The burners on the upper pipes are fixed at a distance of about 0·2 of an inch from the lower ones, in order to bring about a perfect conjunction of the flames of the two sets of burners, and thereby ensure the most favourable conditions for the complete combustion of the gas, and obtain the maximum luminous intensity.

The number of burners, as well as the general dimensions of the apparatus, may vary according to the amount of light required to be produced.

Under the burners is a plate, K (fig. 1), held in position by a cylinder of perforated metal, L, which allows air to pass between the upper and lower rings of burners, the plate, K, also preserving the flames from contact with the current of air entering the lantern.

The Oswestry Town Council and the Liverpool (Vyrnwy) Water Scheme.—At a meeting of the Oswestry Town Council on Tuesday last, a letter was read from Mr. J. Parry Jones, a member of the Council, suggesting that, as the proposed line of pipes to convey water to Liverpool would pass close to the town of Oswestry, power should be obtained to compel the Corporation of Liverpool to sell water to them at a reasonable rate, and that other clauses necessary for the protection of their interests should be inserted. It was agreed by the Council that a Committee should be appointed to carry out Mr. Jones's suggestion.

WEST OF SCOTLAND ASSOCIATION OF GAS MANAGERS.

(*Concluded from p.* 673.)

Mr. W. CHEYNE (Briton Ferry, South Wales) read the following paper on

SETTINGS OF RETORTS, ETC.

The subjects which I have the pleasure of introducing to this meeting are all of importance to those connected with the manufacture of gas, especially so at present, as we may have other sources of light to compete with, and a higher price to pay for coal. Any suggestions, therefore, having for their object the saving of fuel and increasing the yield of gas, will, I am sure, be appreciated by the members of this Association. I may further add that I have devoted a great deal of time to the subjects to be brought before you, and the results have rewarded me for the labour expended.

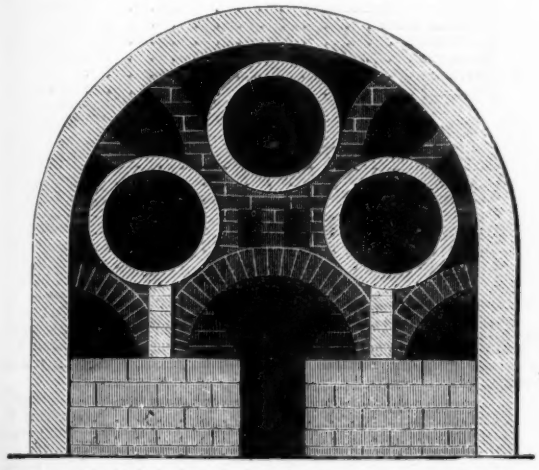
In the first place, the settings of retorts which form one of the subjects of this paper, are one of three and one of five, but six can be worked with the same advantage. I do not intend taking up your time with foundations, &c., but I may state that I prefer the arches formed of one ring of arch bricks 7 by 13 inches (rather than a double ring of 4½ inches), well backed up behind. Some managers prefer giving retorts a fall to the back, so that the tar may not run out when drawing the charge; but I do not believe in tar in the retorts, as I look upon it as so much gas lost, therefore I place the retorts level.

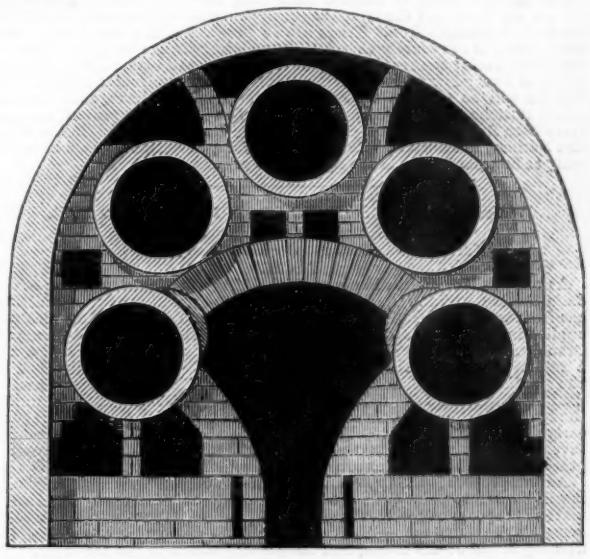
The first thing to which I would direct your attention is the position of the retorts. Not one of the retorts rests on the walls of the fireplace, which, in fact, is the last piece of work done. The two bottoms of the fires rest upon 3-in. walls and brackets thrown out from the sides of the oven, and the others upon 3-in. bricks, the whole forming an arch of themselves. The arches shown are rings of 4½ by 9 inches, springing from blocks and from their position give plenty of room for repairs being done to the fireplace without disturbing the retorts. They are likewise placed very close to the sides of the oven, so as to keep the heat in as close contact as possible.

I will next direct your attention to the fireplace and its position, which is placed much lower down than usual. You will also observe there is a space between the bricks forming the sides of the fireplace and the other brickwork. That space opens into the ashpit, and passes out at the back of the oven. The object intended is to keep cool the back of the bricks forming the fireplace, whereby its life, so to speak, is more than doubled. The bricks forming the sides of the fireplace and flues are arch bricks, the same as those that form the arch of the oven, which gives it a hopper shape. In placing the fire where it is, my object is that the gases from the fire may be properly mixed before coming in contact with the retorts, thereby ensuring a uniform heat all over the oven, which you do not have when the fire is placed higher up. The gases from the fire pass up among the retorts, down into the outside flue, and along the flue next the fire into the space at the back of the oven.

I may add that settings built in on this plan require very little damper, and there is no cutting draught. The setting of three has only one flue, the spaces between the arches being filled in with 3-inch bricks, and for the length of the fireplace sloped as shown.

Lastly, I have worked these settings for some years, and I do not make the following statement as a boast, but simply to show you what can be done with them. My average with them has been over 10,400 cubic feet per ton, and each mouthpiece has produced when required 6700 feet in the 24 hours.





The next subject to which I have to draw your attention is the dip-pipes I have been working with. The object in view was to reduce the pressure on the retorts, and to do away with the pulsation, so as to decrease the deposit of carbon on the retorts, and increase the yield of gas. As you are all aware, the gas with ordinary dip-pipes has to force its way in a body through the tar in the hydraulic main—hence the bubbling noise we hear in the retort-houses, and the cause of pulsation. The dips I have been working with have been of three kinds—viz., one with a side valve, one that could be adjusted with perforated holes near the bottom, and the other fixed with holes near the bottom. The first one had a perforated square in the side of the dip-pipe, covered with a flap valve, working on a knife edge, having two counterpoise weights on a screw rod through the flap, so that you could adjust it to any pressure by screwing the balls in or out—in fact, after the principle of, I believe, Arnot's ventilators. The next was by having the dip cut off short inside the hydraulic main, and fitting a smaller pipe into it having packing round it to form a stuffing-box, having an arch piece on the top, to which a screw-rod was attached, passing through the top of the bridge-pipe, which was tapped to fit the rod, and having a back-nut on the outside, which allowed the inner pipe, which has eight holes 2 inches from the bottom, to be raised or lowered in the event of the hydraulic main getting out of level. The next is the ordinary dip-pipe, having eight holes drilled near the bottom, and the dip adjusted so that the tops of the holes are 3-16ths of an inch below the surface of the liquid in the hydraulic main.

The first one answered the purpose very well, so far as removing the pressure from the retorts was concerned, but it did not give the same amount of steadiness to the gauge as the other two. They can be worked without any perceptible movement of the gauge, as the gas leaves in small streams, and not in a body, and free from all noise. Further, by a simple arrangement the tar is kept 2 inches below the level of the liquor in the hydraulic main. By placing a tongue across the outlet the water is kept on the surface.

I may state that I have been working these dips for over six years, and during that time I have never had a choked ascension-pipe, although I work with high heats, and the retorts keep very free from carbon. I find in using these dips there is more condensing power required, as I believe the gas leaves the main at a higher temperature than by the old method.

I should have liked to have said something on condensation, had I had time to have gone into it, as I believe from what I have tried that if the gas were freed from the tar by a hot process, instead of a cold, we would have gas of a much higher illuminating power; but I trust to be able at some future day to say something on that subject.

At the request of Mr. M'Gilchrist, Mr. CHEYNE explained how the tongue, to which he referrred in the paper, acted to keep the tar from the surface of the liquid in the hydraulic main.

Mr. M'GILCHRIST said that at Dumbarton the late Manager, Mr. Key, fitted up an overflow to the hydraulic main, which he (Mr. M'Gilchrist) thought was second to none that he was acquainted with. Mr. Key read a paper upon it at the Kirkintilloch meeting of the Association in 1873 (see JOURNAL, Vol. XXII., p. 325). It took off the tar from the hydraulic main in the same way that Mr. Cheyne's did with the tongue, which, however, had this disadvantage, that it could not, like Mr. Key's, be regulated while working.

Mr. CHEYNE: But you can regulate the dip-pipe, which is the same thing.

Mr. M'GILCHRIST: With the apparatus I have referred to, you can change the dip or seal as you think fit while working.

Mr. CHEYNE: I have worked this apparatus for six years, and I have never found one single case of choking, and have never seen the slightest deposit on the bottom of the dip-pipes in the hydraulic mains.

Mr. BRODIE: Mr. Key's apparatus is excellent.

The PRESIDENT said that about three years ago he put up a little arrangement for relieving the dip-pipes, which was almost identical with the one described as having been invented by Mr. Key; but it never struck him that it had been brought before the gas world by Mr. Key. The first indication he had of this mode of working was from Mr. David Hunter, late of the Phœnix Gas-Works, Greenwich. All his mains were relieved on this principle.

Mr. M'GILCHRIST asked what percentage of the coke made was required to heat the retort-settings described in the paper.

Mr. CHEYNE said that one retort kept four going, and so on in that proportion. In reply to further questions, he said that, although he used English coal, he was never troubled with naphthaline, though previously to his being appointed Manager at Briton Ferry they used to be very much troubled in that respect. He could not say what got rid of the naphthaline, but he believed the dip-pipe assisted to that end.

The PRESIDENT said it might be that the quality of Mr. Cheyne's gas had something to do with his freedom from naphthaline deposit, or, perhaps, it might be owing to the quality of his coal. This troublesome deposit seemed to be difficult to get rid of in most English districts.

PLACE OF NEXT MEETING.

Glasgow, Port-Glasgow, and Hamilton having been suggested as the place for the next meeting of the Association in April, it was decided to hold it at the latter town.

VOTES OF THANKS.

On the motion of Mr. BROWN, a cordial vote of thanks was given to the President; and, on the motion of Mr. JEFFREY, a similar vote was accorded to the Secretary.

In the evening the members dined together, and on the following day there was a picnic at Castle Campbell.

HEYWOOD LOCAL BOARD WATER-WORKS ARBITRATION.—On Tuesday, the 4th inst., an arbitration was commenced at Manchester, as to the value of certain water rights which the Heywood Local Board have power, under their Act of 1877, to acquire. The following claims are to be arbitrated upon for compensation for reduction of water supply to Naden Brook:—Mr. Robert Hopwood Hutchinson and Miss Mary Susan Ann Hutchinson, £66,000; Mr. Joshua Heap, £12,000; Messrs. Kelsall and Kemp, £10,000; Blackpits Spinning Company, £6500; and Mr. Joseph Fenton, £5000—total, £99,500. The Arbitrators are Messrs. James Farrar, of Bury, and J. Radford—the former being for the Local Board. The Umpire appointed by the Board of Trade is Sir Henry Hunt. The inquiry was continued on the following day, and the proceedings were then adjourned, to be resumed at the Institution of Civil Engineers, London.

EXTENDED USE OF IMPROVED GAS-BURNERS IN FRANCE AND BELGIUM.

In a recent number of the *Journal des Usines à Gas*, a list was given of the several towns in France in which the new gas-burners lately introduced by the Paris Gas Company, for the improved public lighting of the city, have been adopted. We now learn that the number is every day increasing, and that the theatres and *cafés* in Paris are beginning to adopt the new system of lighting for their *façades*. At the Opéra Comique, the Renaissance, the Porte St. Martin Theatre, the Café de Madrid, and other places, it is already in use; and, an impulse having been given, the principal establishments will, it is thought, lose no time in employing large gas-burners for their exterior illumination. Several of the small provincial towns even are joining in the movement, among which may be cited Mantes-la-Jolie, where the window of a drapery establishment is lighted by a number of Giroud's large burners. In Paris, 13 of M. Mallet's new burners have been fitted up; in Lyons, 15; in Toulouse, 28; and smaller numbers in other places. Turning to Belgium, we learn that the Administration of State Railways have lately fitted up, in the goods station on the Quai du Rhin, at Antwerp, 30 lamps with improved burners, similar to those employed by the Paris Gas Company, and each consuming about 50 cubic feet of gas per hour. The lanterns are not, however, of the round form, like those employed for lighting the Rue du Quatre Septembre, in Paris, but are hexagonal in shape, in order to avoid, as much as possible, the cost of repairs. These new gas-lamps will enable vessels to be loaded or unloaded during the night. Several large lamps have likewise been placed in the goods-shed in the Allée Verte, in Brussels. These, too, are of the hexagonal form, and the glazing is so arranged as to afford the smallest possible obstruction to the rays of light. The light is furnished by means of a group of burners consuming altogether about 25 cubic feet of gas per hour, and the lamps are each provided with a reflector made of enamelled wrought iron. Trials are in progress with a new kind of lantern, which is so securely closed that the outer air has no effect whatever upon the flame; the result being that the light will burn so steadily as to allow of a very low pressure being employed. The circular form of this lantern will be suitable for railway stations, and the hexagonal form for goods stations. Two of Sugg's spherical lamps, with improved burners, have been fitted up in front of the Northern Railway Station, in the Place des Nations, in Brussels. The burners employed consume 50 cubic feet of gas per hour, and furnish the light of 200 candles.

WATER GAS: ITS HISTORY AND MANUFACTURE.

By Professor HENRY MORTON, Ph.D.

[From the New York *Plumber and Sanitary Engineer*.]

No. II.

As early as 1780, Felice Fontana, in the *Memorie di Matematica e Fisica della Societa Italiana*, &c., had proposed the production of a combustible gas from water, by passing it over ignited iron and carbon. This idea was applied in a more practical way in 1823 by William Vere and Henry S. Crane, who patented a plan for passing a stream of water or of steam into a retort in which coal tar, resin, oil, or the like, was being distilled for the production of inflammable gas. In 1824, J. H. Ibbetson proposed to "admit steam into the decomposing chamber when in operation among the ignited coal or coke, alone or mixed with tar or oil." Considering the early date of this description, it is very curious to notice how closely it fits several processes which at the present moment are being developed, or practically applied in an experimental way.

As this process is the type and example of a class of water gas processes, it will be well to point out a few of its characteristic features. In the first place it proposes to conduct three distinct operations, at least, in the same vessel at the same time—the decomposition or distillation of the coal, the decomposition of the steam, and the decomposition of the tar or oil. We hardly need experience to teach us that such a combination of actions as this would involve grave difficulty in practice. The process is intended to be continuous, and to involve the use of retorts heated from without.

A marked modification to this process was introduced in 1830 by Michael Donovan, who proposed to bring the gas produced by the action of steam on heated coke into contact with the liquid or vapour of tar, coal naphtha, naphthaline, &c., heated or otherwise. This was a manifest improvement in method upon the previous plans, and also has many features of striking similarity with some of the processes of the present day.

We next find a series of patents containing modifications of the above general processes, until in 1845 we find a new suggestion in a patent by William Pollard, who proposes a blast of steam *in conjunction with air*. The residual nitrogen of the air being, however, in this case left in the product, would render it of no practical value for illuminating purposes.

This idea of making an air blast useful in the retort was, however, developed in a much more practical manner by J. P. Gillard, who, about 1849, at Narbonne, in France, erected a cupola similar to those used for fusing iron. This being charged with coke or charcoal, and ignited and brought to an intense state of combustion by an air blast, steam was admitted to the lower part, and the entire product then formed was collected as an inflammable gas. The steam rapidly cooling down, the furnace was soon stopped, and air again driven in, the products being then discharged into the air.*

Multitudes of patents for processes, either identical with the foregoing, or only differing in unimportant detail from them, have been taken out from time to time, but at the present day those which are attracting most attention may be said to be the Lowe and Tessié du Motay processes.

In the Lowe process a cupola is used to generate water gas. Air is first driven in until an intense heat is developed. The products of combustion pass through a chamber filled with fire-brick arranged in a cellular structure. They thus become intensely heated, and escapé into the atmosphere. Then steam is admitted to the bottom of the cupola (the air blast being shut off), and the carbonic oxide, hydrogen, &c., produced by its reaction, are mingled with rich gas and vapour produced from naphtha, which at the same time is run into the top of the cupola. This mixture passes into the chamber of hot brickwork, where a further reaction is supposed to take place between the water gas and rich gases, and where undoubtedly the rich gases and vapours are decomposed to a greater or less extent, so as to form a certain amount of marsh gas.

An analysis of such a product as this, which was recently made by the present writer, shows the following composition:—

	Per Cent.
Carbonic acid	3·402
Oxygen	Trace
"Olefines," or "illuminants"	12·828
Carbonic oxide	25·233
Hydrogen	34·548
Marsh gas	21·699
Nitrogen	1·408
Paraffins, also "illuminants"	0·869
	99·987

* "Treatise on Gas-Works," by Samuel Hughes, C.E., London, 1865, p. 307.

In reference to the last item in the above analysis, it should be noticed that these paraffins are not normally found in ordinary coal gas, and are not contemplated in the ordinary methods of gas analysis. The first publication in which their presence in water gas was definitely alluded to, and its influence discussed, is believed to be a paper by the present writer and Mr. William E. Geyer, which appeared in the *American Gaslight Journal*, Feb. 16, 1878. As their amount is small, and their determination involved many difficulties, and moreover is of no practical consequence, for reasons not worth discussing here, it has not been considered necessary always to introduce them into an analysis, but to let the same appear as it would be determined in the case of an ordinary coal gas, provided this item did not exceed about 1 per cent.

The Tessié du Motay process, as carried out by the Municipal Gaslight Company of New York, who have constructed very extensive works in which nothing is wanting that the very best skill of the engineer and the most liberal and yet judicious outlay could supply, is operated as follows:—A cupola or "gasogen" is employed to develop the water gas. Air and superheated steam are alternately passed into this, and the products are also alternately discharged into the atmosphere, and passed through a condenser and lime purifier into a holder. From this holder the pure water gas passes through a carburetter filled with shelves, over which petroleum naphtha flows, where it takes up a quantity of vapour of that substance, and is then passed through a series of retorts exactly like those used for the manufacture of coal gas, but which are empty, with the exception of partitions to direct the flow of the gas, and which are very intensely heated. Here the decomposition of the naphtha vapours and their reaction with the water gas are effected. The gas so produced is then cooled and measured, and stored in the holders for distribution.*

A number of analyses have been made of this gas at various times by the present writer, which show such percentage results as the following:—

Municipal Gas, collected June, 1877.

Carbonic acid	0·21
Oxygen	0·14
"Olefines" (illuminants)	15·12
Carbonic oxide	26·18
Hydrogen	27·29
Marsh gas	25·43
Nitrogen	4·45
Paraffins†	1·14
	99·96

Municipal Gas, collected Dec. 12, 1877.

Carbonic acid	0·371
Oxygen	0·600
"Olefines" (illuminants)	17·262
Carbonic oxide	26·790
Hydrogen	27·897
Marsh gas	21·646
Nitrogen	4·243
Paraffins	0·702
	99·511

Analysis of the same gas, in which the paraffins were not determined, but were allowed to appear as a mixture of hydrogen and marsh gas, so slightly changing the relations of these substances, gave the following percentage results:—

Municipal Gas.

Carbonic acid	0·371
Oxygen	1·021
"Olefines" (illuminants)	17·363
Carbonic oxide	27·893
Hydrogen	23·487
Marsh gas	24·622
Nitrogen	5·235
	99·992

It will be observed that all these specimens of water gas contain a very large percentage of carbonic oxide, and much has been said in reference to the objectionable or unobjectionable (not to say desirable) character of this constituent. On the one hand, this gas has been called a "rank poison;" on the other, it has been said not to be exceptionally poisonous, but even to have been used with favourable results as an anæsthetic.‡

* For illustrated descriptions of these processes, we may refer the reader to a series of articles which recently appeared in the JOURNAL, Vol. XXXI., pp. 831, 908, 943, 979; and Vol. XXXII., p. 87.—ED. J. G. L.

† In the first publication of this analysis I indicated this constituent as benzine and like illuminants. Subsequent consideration has led me to adopt the term "paraffins" as a more definite means of indication, "benzine" being merely a trade name for a sort of petroleum naphtha, well known in this country, but liable to be confused with "benzole" (C_6H_6) elsewhere.

‡ As the opinion of a single writer on such a question can have little weight, I will simply quote a few samples of the terms in which this gas is spoken of by the standard chemical authorities, and those who have made toxicology and hygiene a special study. Murray, Edinburgh, 1809: "It is fatal to life when inspired." Gorhams, Boston, 1819: "It is fatal to animal life." Brande, London, 1821: "It is fatal to animals." Ure's Dictionary of Chemistry, 1821: "When inspired it is fatal to animal life." Henry, London, 1823: "It is extremely noxious to animals." Thénard, Paris, 1834: "It kills immediately the animals that breathe it." Berzelius, Paris, 1838: "Animals die immediately in carbonic oxide gas, and persons who have tried to breathe it have fallen down unconscious." Daniel, London, 1843: "It is speedily fatal to animals." Graham, London, 1850: "It is very fatal to animals." Regnault, Paris: "Oxide of carbon is not merely passive in not supporting respiration, but is active as a poison, for an animal perishes if left for some time in an atmosphere containing a few per cent. of this gas."

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

Although there is not such a push of orders in the market as was the case a fortnight ago, prior to the recent advance in quotations, there is a steady demand for the better classes of round coal, and for these, higher prices are generally being obtained. Best Lancashire house coal, such as the Wigan Arley and Orrell mines, now quoted at from 9s. to 9s. 6d. per ton; second qualities, such as common Arley and Pemberton four-feet, at from 6s. 9d. to 7s. 6d.; and the common Wigan mines, suitable for house-fire purposes, at from 6s. to 6s. 6d. per ton at the pit. It is, however, only in house-fire qualities of fuel that any upward movement in values has yet been found practicable, the demand for all other descriptions of fuel, although better, not being such as to enable colliery proprietors to command any higher rates. The common classes of round coal for iron-making and steam purposes are going more largely into consumption; but there is no scarcity of supplies in the market, and ordinary qualities can be bought at the pit mouth at from 5s. to 5s. 6d. per ton. Burgy is still a drug, owing to the depression in the cotton trade, and prices at the pit mouth remain at from 3s. 9d. to 4s. 3d. per ton. For slack there is more inquiry, owing to increased activity in the chemical and salt trades, whilst there is more being used in the manufacture of coke; but the prices

obtained are no higher, and good slack can be bought at the pit mouth at from 2s. 9d. to 3s. 3d., and common sorts at about 2s. per ton.

In the shipping trade there has been rather more activity, and for the better classes of Lancashire coal higher prices are being obtained, but other sorts continue low.

For coke there is more inquiry, but not such as to affect prices, and at the ovens in the Manchester district quotations remain at 14s. per ton for best, and 10s. for common cokes.

There is at present only a moderate demand for pig iron in this district, but local makers have been securing good orders for Staffordshire, and as they have heavy deliveries to make on account of old contracts, prices remain firm at late rates, and for both foundry and forge qualities delivered into the Manchester district the quotations are 53s. per ton, less 2½ per cent. In the finished iron trade a good demand is maintained, and prices continue to advance, best Lancashire bars delivered into the Manchester district being quoted at £7 per ton, and inferior sorts at £6 12s. 6d. and £6 15s. per ton.

There is not yet any general material improvement in the position of founders, engineers, and machinists.

THE COAL AND GENERAL TRADES OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The gas coal trade to London got behind somewhat last week, from the prevailing stormy weather in the North Sea again keeping back steamers bound from the South, and also, at the same time, to some extent blocking the outward trade from the coal ports. Rather higher rates had to be paid steamers to load coals for the Thames; 5s. and 5s. 3d. were the ruling rates, and the colliery offices were glad to get steamers at these prices, so as to keep their deliveries full. There was a dearth of small sailing ships the week before last; but, as there were fair arrivals of suitable tonnage in the early part of last week, by offering tempting freights—about 2s. a ton over the quotations of a month ago—enough tonnage was engaged to meet the immediate requirements of the Irish gas-works, and the shipments were pretty full. Nearly 9s. per ton was paid in most instances to small sailing vessels to take gas coals out to Dublin, Cork, Waterford, and some other Irish ports. The stormy weather has tended to keep steamers back which are on their "fall" voyages from the Baltic to the United Kingdom. Until some of them come back to coasting there will be a difficulty in the way of merchants, brokers, and coal owners securing all the tonnage they need at a reasonable rate of freight.

The best gas collieries, it is unnecessary to repeat, are very busily employed. They have every prospect of continuing so over the winter; in fact there is comparatively no great quantity of the very best sorts of gas coals, especially from the leading collieries, in the open market. The demand for second-class gas coals has improved; but it is not so good as for first class. The reason is simple enough. The carriage of a ton of first-class coals by steamer or sailing ships is the same as the freight of a ton of second-class; and, as rates advance, the inducement to buy first-class coals in preference to seconds becomes stronger. Second-class gas coals, however, are more in demand than they were for coke making, for the iron and chemical works, and such other local needs arising out of the improvement in trade in the North. This demand is likely to get better weekly, as not only iron-works, but chemical and other factories, which have been long idle, are being got into employment again. The advance in the price of coals is not very excessive, however. In the opinion of business men of great experience in the trade, the rise in the values of coals of all descriptions over next year will not be of a very startling character. As coke was very low in price when the reaction set in in the iron trade, its price has improved more than upon any class of coals. However, after a number of large contracts were made at a rise of from 1s. to 1s. 6d. per ton upon the prices then current, there was a pause in the upward tendency of quotations of prices, and they have not been much exceeded yet.

The chemical market has been improving gradually, but steadily, since the beginning of November, and a week or two before that period. This is mainly due to the strong demand that has sprung up from America. But as Continental and English merchants began to find the market going against them without the aid of "bulls," they sent their orders in, and stocks have thus been cleared out. The general tendency of this trade has been to show a rise of at least 1 or 2 per cent. every day over the period mentioned. Crystals of soda might have been bought in the middle of October at £2 10s. to £2 12s. 6d. per ton. They were sold upon Newcastle Exchange, on Saturday last, at £4 per ton net. Bleaching powder, which is £7 per ton, shows a rise of 30s. per ton at least, and there is a similar improvement to note in ash, which is being bought up pretty sharply at 1¾d. net. A quantity of ash has been sold at 1¾d., less 5 per cent. for next year's delivery. All other kinds of chemicals show a similar rise. The price of ordinary Spanish lead is from £16 12s. 6d. to £16 15s. per ton. The manufacturing iron trade is also getting better, and recently a considerable quantity of pig iron has been bought by founders in all parts of the United Kingdom to make up stocks.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

The Directors of the Kilbarchan Gaslight Company met on Monday, the 10th inst., and, after due consideration, resolved to reduce the price of gas to consumers 10d. per 1000 cubic feet, the reduction being from 6s. 3d. to 5s. 5d. Mr. James Millar was re-elected Clerk and Manager to the Company; Mr. John Cochrane, Treasurer; and Mr. James Gray, Collector.

At a meeting of the Kilmarnock Town Council, held last Wednesday, Mr. Andrews, Convener of the Gas Committee, stated that the question as to giving monthly reports had been before them, and that they were quite willing to comply if the Council wished them to do so. After some conversation it was agreed that the Committee should report monthly. Mr. Andrews subsequently remarked that he had been connected with the Gas Committee ever since the purchase of the works by the Corporation, and that he could testify that there was a great deal of misconception in the public mind regarding the quality and pressure of the gas. He had often tested it himself, unknown to the Manager, and found it generally between 27 and 28 candles. Then as to the pressure. A member of the Council had stated at a ward meeting that there was a pressure put on in order to draw money out of the consumers pockets. That was quite a groundless and uncalled-for allegation. The quality of the gas was equal if not superior to that given in any other town in Scotland, and the price was very moderate, being only 4s. 2d. per 1000 feet. He thought the Committee had done their work well.

The election of the Dundee Gas Commissioners was completed during the past week. Including the Provost and Senior Bailie, there are four *ex officio* members; then there are five from the Town Council, four from the Guildry, five from the Chamber of Commerce, two from the corporation known as the Nine Trades, and one from that known as the Three Trades—or 21 in all. At a general meeting of the members of the Nine Trades, held on the 10th inst. for the purpose of electing two of their number to serve on the Gas Commission for the ensuing year, Mr. David Anderson stated that the works were in a very efficient state, and that the community were receiving very cheap gas in consequence of the low price of coal. All the materials required for producing the gas were obtained by contract, and in the acceptance of the offers everything was done above-board. The Conveners of the Works and Finance Committees, who had discharged their various duties to the satisfaction of the Commission, had been ably assisted by Mr. M'Crae and the other officials of the Commission. He thought the community of Dundee had reason to congratulate themselves that they had the manufacture of gas in their own hands. The retiring members, Mr. D. Anderson and Mr. J. Lindsay, were then unanimously re-elected. The Chairman (Mr. Convener Mitchell) mentioned that the revenue of the Commission for this year, so far as it had gone, was up to the estimate, and that the quantity of gas manufactured and sold was somewhat beyond it, so that they might look for a favourable balance at the end of the year.

In their capacity as the Pier and Gas Corporation, the Town Council of Dumbarton are at present very much concerned about a debt deficiency which has arisen in connection with the pier revenue during the past year, and a feeling has been expressed that it ought to be defrayed out of the surplus from the gas revenue. In the meantime it has been met by a loan from the Common Good of the town. At a meeting of the Corporation, held last Wednesday, the question came up for consideration. After some conversation, the Provost said they might discuss the matter on its merits next month, and went on to say if the Gas Trust was to be saddled in the same manner annually, instead of being the most popular Trust in the town, it would become the most unpopular. If next summer coal continued at the price at which it now stood, and the pier required as large a subsidy, then they would have to raise the price of gas. The margin of profit just now could do little more than afford the subsidy; their coal contract, which was made under favourable circumstances, would last till August next; but if the price was then as high as at present, what he had stated would follow. The further consideration of the matter was delayed in the meantime.

On Monday, the 10th inst., the Works and Finance Committees of the Edinburgh and District Water Trust, held a joint meeting for the purpose of receiving a provisional report from Mr. Adam, City Chamberlain, with reference to the financial position of the Trust. After hearing the reports, together with a letter from Mr. Adam explaining the ground upon which he had proceeded in arriving at the results brought out in the statement, the Committees agreed to authorize Mr. White-Millar, Law Agent of the Trust, to proceed with the preparation of notices for a Bill to be promoted during the ensuing session of Parliament, conferring additional borrowing powers on the Trust. At a public meeting of the Trust, held on Thursday, the question of taking any steps in the way of promoting a Bill was discussed at some length, and the recommendation was eventually agreed to by a majority of 18 votes to 3. In consequence of complaints as to the quality of the water from the Moorfoots, it was remitted to the Works Committee to have analyses made of the water taken at the various sources of supply.

The water question at Annan is still dragging its "slow length along." At a meeting of the Police Commissioners of that town, held on Monday last week, Provost Nicholson entered upon a comparison of the rival schemes, prepared by Messrs. Leslie, C.E., of Edinburgh, and Mr. Gale, C.E., of Glasgow, for supplying the burgh with water, and concluded by recommending that of Messrs. Leslie, which provides for pumping water from the River Annan, near to the town. Ex-Provost Batty said Mr. Gale declared that the pumping scheme would eventually be as expensive as a gravitation scheme. He moved that Mr. Gale be requested to furnish a fuller criticism of Messrs. Leslie's proposal. On a division, the motion was lost by 8 to 7. It was afterwards resolved to adjourn the meeting for a week to further consider the question.

Business was done in Edinburgh and Leith Gas Stock on Monday last week at £31; and on Friday, Glasgow Corporation 9 per Cent. Annuities were disposed of at £217.

The Glasgow pig iron market was more regular during last week, and, on the whole, there was a quiet but steady improvement, which seems to indicate that the market is getting more out of the region of rash speculations. This is certainly very satisfactory. The home trade continues to develop on all hands, and the improvement has every appearance of solidity and permanence. Up to 56s. 1½d. cash prompt, and 56s. 3d. fourteen days, were paid on Friday afternoon, being an advance of 1s. over the previous Friday's closing prices.

There has been some uncertainty in the coal market since my last report, in consequence of the colliers not working in the Lanarkshire mining district. Shippers are getting readily supplied from Fife and Ayrshire ports. The home demand is not large, and the supply at present is ample. Prices remain steady, and there is no inclination on the part of purchasers to pay higher rates.

It is announced that Mr. George Gill, for many years associated with the tube trade of Walsall, has been joined by Mr. Thomas Addison Russell, until recently Secretary and Manager to Messrs. John Russell and Co., Limited. The style of the new firm is Gill and Russell.

Garstang Gas Company, Limited.—This Company was registered, without special articles, on the 7th inst., with a capital of £2000 in £5 shares, to supply gas and gas products to the inhabitants of the townships of Barnacre-with-Bonds, Cabris, Catterall, Kirkland, Nateby, Garstang, and Winmarleigh, all in the county of Lancaster.

Accident at the Phœnix Gas Company's Works.—Last evening's papers report that an accident occurred at the Phœnix Gas-Works yesterday morning, resulting in shocking injuries to a girder-fitter named Lawton, aged 38 years, residing at Gorton, near Manchester. While fixing a large girder, it fell, crushing the unfortunate man beneath it, and he now lies at St. Thomas's Hospital in a precarious condition.

The Sewage Question at Cambridge.—The Cambridge Improvement Commissioners have informed the Local Government Board that they are not yet fully satisfied that Sir Joseph Bazalgette's scheme is the best for diverting the sewage from the Cam; and that, until a Valuation Bill is passed, settling certain financial matters between University and Town, it will be impossible to undertake an expensive scheme of sewage. Meanwhile, the death-rate at Cambridge is among the lowest in the country.

Moscow Metropolitan Gas Company, Limited.—A Company was registered, on the 10th inst., under the above title, with a capital of £550,000, in £20 shares, for the purpose of taking over a concession dated the 29th of January, 1865, entered into by Armand Bouquie and Neville Davison Goldsmid with the Municipality of Moscow, for lighting that city with gas, and to take over the property and liabilities of the City of Moscow Gas Company, Limited. Power is taken to supply gas or other light to any other place in the Russian Empire.

Sales of Shares in the Halesworth and Worksop Gas Companies.—On Monday, the 10th inst, Messrs. Lenny and Smith sold by auction twenty £5 shares, and £331 worth of subscription stock in the Halesworth Gas Company. The shares realized £155, and the stock £544 15s. Both

shares and stock were sold with the dividends accruing thereon from July last.—On Wednesday last, Messrs. Mayor and Son sold fourteen £1 preference shares, and ten £5 ordinary shares in the Worksop Gas Company. The £1 shares each realized 5s. premium, and the £5 shares were sold for £7 10s. each. These shares were sold with the dividend accrued due since June last.

Visit of the Duke of Beaufort to the Swansea Gas-Works.—His Grace the Duke of Beaufort, who is staying at Singleton, together with the Hon. A. Quintard, of New York, visited the works of the Swansea Gaslight Company last Tuesday. The Duke, who was introduced to the Manager (Mr. Thornton Andrews) by one of the Directors (Mr. Thomas Glasbrook), minutely examined the whole process of the manufacture and purification of gas, expressing his pleasure as the details were explained. The fine retort-houses, engine-houses, and manufacturing plant were examined, and the process of oxide of iron purification attracted special interest. The Duke appeared pleased on being informed that a great portion of the coal used by the Company was obtained from his coal estates—Rhydydefed and Beaufort Collieries. After inspecting the drawing and charging of the retorts, he left the works, apparently much pleased, and cordially thanked Mr. Andrews for his attention and explanations.

Wigan Corporation Gas Supply.—It has been resolved by the Wigan Town Council to promote a Bill for general improvement purposes in the next session of Parliament, and the following is the statement submitted to the Agents in respect to the gas portion of the Bill:—The Wigan Improvement Act authorized the raising of £140,000 for the purposes of that Act relating to gas, and, with the sanction of the Local Government Board, such further sum as the Corporation should require for the extension and improvement of the gas-works, not exceeding £50,000. The Corporation have bought and reconstructed the gas-works, have relaid the gas-mains, and extended the supply. They have obtained sanction of the Local Government Board empowering them to raise the £50,000, but further extensions and improvements are still required:—1. August 25, 1876, sanction to loan of £10,000; 2. May 26, 1877, ditto, £30,000; 3. July 3, 1879, ditto, £10,000—total, £50,000. For the purpose of extension and improvement of the gas-works, the Corporation desire power to borrow, with the sanction of the Local Government Board, sums not exceeding £30,000.

Explosion at the Dorchester Gas-Works.—Last Thursday morning, about nine o'clock, a singular explosion occurred at the works of the Dorchester Gas Company. It seems that an old gasholder-tank, 26 feet in diameter and 10 feet deep, brick lined, and covered in at the top by asphalte, concrete, and brickwork, supported on girders, was used for storing ammoniacal liquor. The covering of the tank formed part of the yard, and about two or three tons of coke were stacked on it. At the time named, just as a barrow-load of freshly-slaked coke had been brought out of the retort-house and deposited on the heap, an explosion occurred in the tank, the top being blown off and the bricks, concrete, and asphalte sent flying in all directions. One of the Company's clerks and three other men were slightly hurt, while the damage done is estimated to be only about £50. None of the machinery or plant at the works was injured, and there was no interruption in the supply of gas to the town. An inquiry has been made by the Manager, Mr. W. Osmond, as to how gas could have got into the tank so as to form the explosive mixture, and further opinion will be obtained on the point.

Explosion of Gas at Hove.—On the evening of Sunday, the 9th inst., an explosion of gas, by which eleven persons were seriously injured, occurred in Goldstone Road, Cliftonville, at a house in the occupation of a Mr. J. French, a confectioner. It would appear that Mr. French, his wife, and family, together with other friends living in the immediate neighbourhood, went for a drive to Worthing on the evening in question. During their absence the house was locked up, and, on the party of eleven persons returning, they adjourned to the house of Mr. French. On entering the house a strong smell of gas was noticed. The private door having been left open a few minutes in consequence, it was thought safe to light the gas in the sitting-room. The whole party were at this time inside the house, some in the room and some in the passage near the door. No sooner, however, was a light struck than an explosion followed, which blew one of the party through the open doorway into the road, at the same time slamming-to the door. The remainder of the party were made prisoners, when two other explosions followed in quick succession. The result of the explosion was most lamentable to all within the house, some being so shockingly burnt about the head and face that their features are totally unrecognizable. Considerable damage was occasioned to the premises; the plate-glass shop front was blown out, the glazed door communicating between the sitting-room and the shop was shattered, the whole of the furniture of the room was, as well as the walls and doors, scorched and burnt, and in the upper part of the house several windows were broken. The damage is estimated at £200.

The Farnworth Sewage Case.—The action brought against the Farnworth Local Board by the executors of the late Mr. W. J. Rideout for the pollution of the water in the reservoirs connected with the Farnworth Paper Mills, will very shortly be again brought before Vice-Chancellor Hall. It will be remembered that when the case was before the Vice-Chancellor in the spring, he directed that the matter should come before him on the second motion day in Michaelmas Term, and at the last meeting of the Farnworth Local Board orders were given to apply to the Court for a further extension of the time referred to in Vice-Chancellor Hall's order. Since the case was before the Superior Court, the Board have obtained a site for their sewerage works, and they are now awaiting the Local Government Board's sanction to an application for power to borrow the sum of money estimated as required for the carrying out of the scheme. The plans prepared by the Board's Surveyor (Mr. James Lomax) have been examined by one of the Board's inspectors, and approved by him, subject to one or two slight alterations which he suggested should be made in them. Beyond this, however, it cannot be said that the Local Board have done anything in a practical shape, and it will be curious and interesting, not only to the ratepayers but to public bodies also, to note the form which this long-pending action will next assume. Now even that the plans have been prepared, it is not at all improbable that, if they are carried out as they stand, further cause for litigation will be the result, and such as was not meditated during the earlier stages of the proceedings. At present there does not appear to be any sign of an amicable settlement of the points in dispute.

Wolverhampton Corporation Water Supply.—The annual report of the Water-Works Committee of the Wolverhampton Town Council, presented at the quarterly meeting held yesterday, states that, during the twelve months ended Sept. 30, 702 new premises were laid on, producing an income of £661 per annum, the loss of income by premises being cut off was £121, leaving a net increase of £540 per annum. The total quantity of water consumed was 844,067,400 gallons, showing an increase of 101,457,800 gallons as compared with the previous year. This quantity shows a daily average of 2,312,513 gallons. The township of Bilston consumed 96,532,050 gallons, or a daily average of 264,471 gallons, being 44,471 gallons per day more than the minimum quantity contracted for. The quantity of water pumped for consumption, after deducting water supplied to Bilston and to customers for trade purposes, show a daily average per head of customers supplied of 19½ gallons, against 17 gallons last year. This large increase of consumption was caused by the severe and long-continued frost of the past winter, and as there has been no corresponding increase in the revenue, the loss has been considerable. With a view to reduce as much as possible the undue consumption and waste of water, the Committee have appointed a water inspector, whose duties will be to visit regularly all water-taps, fittings, and apparatus; to see that they are in proper repair, and to report all cases of waste and misuse which may come under his notice. The Committee consider it a matter for congratulation that, notwithstanding the largely-increased demand in the early months of the year, they were able to supply the water required without serious inconvenience. During the year the whole of the engines, boilers, and plant were maintained in a good state of repair and working efficiency.

The Electric Light at the British Museum.—An esteemed correspondent has called our attention to the following, which appeared in the *World*:—"The electric light is not altogether a success at the British Museum, although the temporary prolongation of time up to seven o'clock in the reading-room, is decidedly a most valuable and widely-appreciated improvement. The four electric candles which supply the light are continually spouting with a peculiar noise, their light is fluttering and unsteady, and its tint is rather unwelcome to the retina. Of the latter peculiarity, by the way, the attendants, who object to the prolongation of reading-hours, make capital by sporting blue spectacles, which give them quite an affecting appearance. I went there the other evening, about six o'clock, and was much struck by the fact that, although the reading-room was lighted by electricity, *nearly all the officers connected with it had oil-lamps or lanterns*. Now it occurs to me that if oil-lamps are of any danger in the reading-room proper, they are just as much so in any other part of the building, and I am consequently led to admit that the opposition to light which had been entertained up to this time by the British Museum authorities, proceeded more from a natural desire to be home early than from any serious apprehension for the safety of the books. It being now practically admitted that with proper care and supervision no real danger to the national collection can arise from any system of lighting, I would suggest the desirability of putting on its trial in the reading-room some other kind of light than the present one. For instance, I do not see why the skylight in the cupola could not be used as a luminous ceiling, by means of ordinary gas burning outside in a glass case. The system has been in use many years in several Paris theatres, and could not possibly be more dangerous than a single bull's-eye or hand-lamp inside the building."

The Sanitary Congress at Croydon.—The proceedings in connection with the Congress of the Sanitary Institute at Croydon were brought to a close on Saturday, the 8th inst., when a meeting was held in the Public Hall for the purpose of announcing the awards of the judges on the articles sent to the exhibition held in conjunction with the Congress, and referred to on p. 699 of the present volume of the Journal. The chair was occupied by Dr. Richardson, who was supported by a number of gentlemen interested in sanitary science, some of whom attended for the purpose of delivering short addresses on subjects connected with the object of the Institute. The proceedings opened with the reading of the awards of the judges, and this was followed by an address by the Chairman, on "Health at Home." Then came a communication by Mr. E. Chadwick, C.B., after which Mr. G. J. Symons, F.R.S., read a paper on "Pure Water." After pointing out the many causes which led to contamination of water, he spoke of the evils resulting from the neglect of filters, and in his concluding remarks he said: "Several causes are tending to render pure water increasingly scarce in this country. Our population is advancing at a rapid rate, and therefore more clean water is required, and more water is dirtied every year. The moorlands, whence much of our best drinking water comes, are being brought into cultivation, I mean being treated with manures, &c., which will dissolve and run into the streams. Our rivers have, many of them, become rather sewers than rivers; and, no matter how bright the effluent water of a sewage farm may be, it is hardly pleasant to be obliged to drink it. The tendency of our population to congregate in towns of great size renders the providing of an adequate supply of pure water for their use a matter of great difficulty and magnitude, and, as there seem very strong reasons against the supply of two qualities of water to each house, the total volume of water required for our large towns is enormous. There has, moreover, sprung up a sort of rivalry in the promotion of big schemes, and as there is no public department to look after the subject, and the decisions are given by Private Bill Committees, who never have the national bearings of the scheme brought before them, the result is that the rich and the venturesome have it all their own way, and the Committees hand over to them in perpetuity stores of water which, under a wiser *régime*, would be duly administered for the benefit of the nation at large." Other papers and addresses followed, and the proceedings closed in the usual manner.

Register of Patents.

1564.—Lake, W. R., Southampton Buildings, London, "*Improvements in apparatus for igniting and extinguishing gas by electricity, parts of which improvements are applicable in the employment of electricity for other purposes.*" A communication. Provisional protection only obtained. Dated April 18, 1878.

This invention is designed to provide means whereby any number of burners may be lighted or extinguished by one operation, at the gas-works or at any other convenient and suitable place within the electrical circuit. The operations of turning on and turning off are in some instances effected automatically by employing a clock, which, in connection with suitable devices, may be arranged to make and break the contact at proper times; or these operations may be performed by hand, by means of any ordinary device provided for the purpose.

The invention also comprises apparatus specially designed for use with single gas-burners, and by means of which the gas is ignited by making and breaking the electrical circuit, and thus producing a spark or sparks in the act of turning the cock or tap of the burner. Also improved means for supporting the conducting wires for electrical currents upon lamp-posts by providing attachments which may be readily affixed to any ordinary lamp-post. And, further, an instrument or apparatus to be attached to a lamp-post, or in any convenient place within the circuit, for facilitating communication with police or other stations, or the like.

1582.—Rogers, J. E., Smethwick, "*Improvements in adjustable spanners or screw wrenches, and in pipe-tongs, and in combined pipe-tongs and pipe-cutters.*" Patent dated April 18, 1878.

This invention, as applied to an adjustable spanner or screw wrench, consists of a stationary jaw on the end of the bar of the spanner, and a moveable jaw capable of sliding, as usual; but instead of making the handle of

the spanner and the bar carrying the fixed and moveable jaws in one piece as usual, the handle is jointed to the bar, and the moveable jaw is connected to the jointed handle in the following manner:—The jointed end of the handle part of the spanner is forked, and between the branches of the fork the end of the spanner bar is placed. By means of a screw-pin passed through holes in the end of the spanner bar and fork of the handle, the bar and the handle are jointed together, the handle being capable of turning on the bar, so as to be placed either in a line with the bar or at an angle thereto. The fork of the handle is slit or divided at its rear part, so as to make the branches of the fork elastic, and capable of being closed upon, or separating from the end of the spanner bar.

These improvements may be applied to the adjusting of the moveable jaws of pipe-tongs; and the invention consists further in improvements in combined pipe-tongs and pipe-cutters.

1589.—Alexander, E. P., Southampton Buildings, London, "*Improvements in valve-cocks or faucets.*" A communication. Patent dated April 20, 1878.

This invention relates to a construction and arrangement of valve-cock or faucet having a continuous unobstructed fluid passage and a self-closing valve. The shell or casing may be of any suitable metal or material, and any appropriate form. It is fitted with a branch having a screw-threaded projection or nipple, fitting an opening in the under side of the casing. A valve is provided having a packing at the under face, resting on the seat formed at the upper end of the nipple, a fluted valve-stem extending into the nipple. A coiled spring situate above the valve receives a stud on the top of the valve, and bears against the top of the interior of the casing. If, therefore, the valve be pushed up from below, the liquid will pass freely to the branch without being retarded by any of the obstructions commonly placed within the casings of faucets and valve-cocks.

1591.—Hislop, G. R., Paisley, and Young, W., Clippens Oil-Works, Renfrew, "*Improvements in revivifying spent lime, and in the means or apparatus therefor.*" Patent dated April 20, 1878.

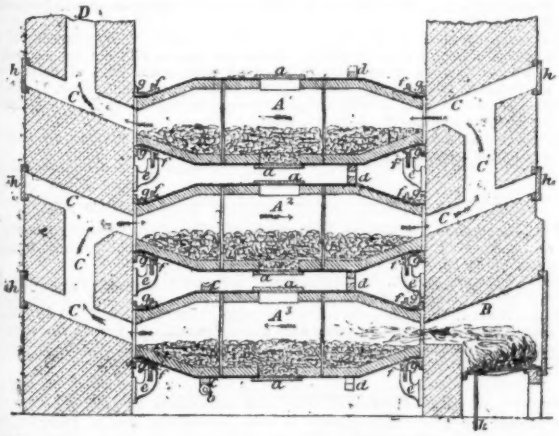
This invention relates to improvements in revivifying, or again rendering caustic, lime which has been made foul in the process or operation of purifying coal or other illuminating gas, or in the manufacture of soap, soda ash, caustic soda, &c.

The apparatus consists of a cylinder or cylinders formed of any suitable material, preferably iron, protected by a fire-clay covering, the interiors of which are in communication with a furnace wherein carbonaceous matter is burned, or with a steam-boiler for the purpose of facilitating the removal of gaseous impurities by passing steam through the lime. The cylinders are slowly rotated or oscillated by a tangent screw and worm wheel, or by the equivalent thereof, and they may be placed over each other in such a manner that the lime may be charged into the upper cylinder, passing thence from cylinder to cylinder in one direction, whilst the products of combustion pass through in an opposite direction. In place of using a series of cylinders, however, one longer and inclined cylinder may be substituted. Under another construction of the revolving cylinder it may be divided into two, three, four, or more compartments arranged inside an outer cylindrical or equivalent case; the purport of this construction being that the spent lime shall expose as large a surface as possible to the action of the products of combustion from the furnace.

All the forms of this rotating or oscillating revivifying apparatus are provided with hoppers or receivers, or their equivalents, for charging the foul lime into them, and they are also provided with one or more chambers for receiving the lime after it has passed through the rotating or oscillating cylinders. These last-mentioned chambers are for the purpose of allowing the lime to cool down before being exposed to the atmosphere, and the air employed for this cooling becomes thereby heated preparatory to combustion with the fuel of the furnace.

The supply of lime to the revivifying apparatus may be either intermittent or continuous. In the latter case the apparatus is preferably fitted with feeding rollers, screw feeders, or their equivalent. The interior of the revolving or oscillating cylinders may be fitted with continuous or discontinuous ribs, either spirally or longitudinally, for the purpose of aiding the turning over of the lime, and regulating its delivery through the retorts whilst being burnt. These ribs also have the effect of exposing a larger surface of the lime to the action of the revivifying gases. It is also preferred that the framework in which the rotating or oscillating retorts are carried should be fitted with screws, levers, or their equivalent, for adjusting the position of the retorts from time to time as may be required.

At the upper end, the rotating or oscillating cylinders may be connected to an exhauster when it is desired to collect the gaseous or condensable substances passing off, or produced by the action of the fire gases or steam upon the foul lime.



The above engraving represents one arrangement of the means or apparatus employed for carrying out the invention. It consists of a series of chambers, A^1, A^2, A^3, which are situated one immediately above the other. The chambers are supported at either end upon antifriction rollers, carried in the grooved brackets, *e*, the circular ribs, *f*, fixed to the chambers running on the rollers. The ends of the chambers enter sockets formed by circular angle irons, *g*. The chambers are slowly rotated by a tangent screw, *b*, gearing with a tangent wheel, *c*, fixed to one of the chambers, the motion being communicated to the other chambers by toothed gearing, *d*. The chambers are open at either end, and these open ends are in communication with inclined flues, C, C, and uptake flues, C^1, C^1, the flues and chambers forming a continuous passage from the furnace, B (wherein carbonaceous matter is burned), to the chimney at D. The chambers are provided with openings closed by doors, *a*, through which the lime may be charged into the chambers. The doors are shown in the drawing as being doors which open by sliding in grooves in the direction of the length of the chambers, but they may be lined with fire-clay, and secured by a slip bolt to the chamber, or fastened in any other convenient manner.

The process of revivifying the spent lime is carried on by submitting it in each rotating chamber, for the necessary length of time, to the action of the products of combustion from the furnace, B, which products pass upwards over the lime in the chambers in a direction (as indicated by the arrows) the reverse of that in which the lime passes downwards through the series of chambers. After the lime has been thus treated, the apparatus is brought to rest, and the door, *a*, of the chamber A^3 opened. The lime in a revivified condition discharged from it is allowed to cool. After the lower chamber is thus emptied, the lime in the next chamber, A^2, above is discharged therefrom into the chamber A^3, and the lime from the upper chamber, A^1, is discharged into the middle chamber, A^2, foul lime being fed into the upper chamber, A^1. The doors are then closed, and the apparatus again set in motion as before, this being continued until the lime in the lowest chamber, A^3, is revivified, when it, as well as the other chambers, A^1, A^2, is again discharged and refilled in the same manner as before.

By this apparatus for carrying on the process of revivifying spent lime, the lime in the upper chamber or chambers is desulphurized by the carbonic acid discharged from the lime in the lower chamber or chambers, and the lime in the lower chamber or chambers being submitted to the more intense heat from the furnace has thereby the carbonic acid expelled from it. The flues, C, C, are continued through to the outside of the brickwork, where they are closed by doors, *h*. This arrangement allows of the insertion of a rake or tool by which to thrust the lime from the cylinders in discharging. A flue may be provided leading direct from the furnace to the chimney, which flue may be closed when the apparatus is in operation, but direct communication therethrough is established when the chambers are being emptied, the flue from the furnace being then closed; and all this may be effected by any of the well-known arrangements of dampers.

Various modifications of the apparatus are shown and described in the specification.

1604.—Longsdon, A., Queen Victoria Street, London, "*Improvements in apparatus, tools, and machinery for charging and drawing gas-retorts.*" Patent dated April 20, 1878.

In the machines heretofore invented, the patentee says, for charging gas-retorts in a mechanical manner, use has been made of a scoop or trough, which has also been used in hand charging. This scoop is open at the top, and is pushed into the retort filled with coals; it is then turned over and thus emptied in place, or it is emptied by withdrawing the bottom, which is in one or more parts. To the first-named class belong the machines of Green, Best, Holden, Somerville and Robinson, Mann, Richards, Darlington and Scott, Warren and Wates, and Foulis; and to the last class those of Taylor, Buckley, Chadwick, Rowbottom, West, and Rowland. The differences between the machines consist mainly in the mode of lifting, horizontally moving, and turning the scoops, while the kind of motor applied, the supply of coals, the simultaneous charging of two or more retorts, the mode of moving the apparatus, &c., form no essential points of the charging. Retorts are not set with mathematical accuracy in the bench, and are exposed to great heat, whereby they, in course of time, suffer more or less alteration in form, not only in their cross sections, but also in their longitudinal sections, partly by the formation of carbon, and partly by sagging and softening. In consequence, the particular form of each retort has to be considered in the insertion and turning of the rigid scoop by hand; but with a mechanical motion of the rigid scoop this is out of the question.

According to this first part of this invention, a scoop charged with coals is placed opposite to the mouth of the retort, but is not introduced into the retort as heretofore, but only rests at one end of the mouthpiece. The introduction and distribution of the coals in the retort is not accomplished by the scoop at all, but by means of a frame placed in the scoop. This frame is composed of an upper sliding bar or framing, or bars with cross pieces or stops, and having leaves or flaps hinged to it, at or about equal distances lengthwise from one another. The leaves hang down into and divide the scoop into parts or spaces entering into or between the coals. This leaf frame is pushed forward in the scoop and into the retort, carrying along with it the coals, which are thus delivered into the retort. By the movement of the leaf frame in this, the forward direction, the leaves or flaps stand vertically by reason of the cross bars or stops; but when drawing it back they draw out of the coals and fold up under the top bar or bars to which they are hinged, and lie on the charge.

The whole charging apparatus may be conveniently arranged on a suitable carriage of cast or wrought iron, consisting of two symmetrical halves, and supported by four wheels running on rails placed parallel with the retort-bench, or vertical to the length axes of the retorts. The apparatus is of such a width as to be suitable for the usual space left between the front face of the bench and the wall of the retort-house.

The second part of the invention consists in the arrangement and construction of retort-drawing apparatus, concerning which the patentee says: As regards the construction of the rake tool there is a greater variety proposed than as regards the retort-charging apparatus. Thus Green, Rowland, Richards, Foulis, and others, employ a plain rake with turned-up end, and give it a turn of 90°, or press it only into the charge; Best and Holden employ a fixed shovel at the end of the bar; Holden, and Somerville and Robinson, use a moveable flap instead of the shovel, and run it in horizontally and out vertically; Mann adds to the flap a small shovel in front for clearing out the front end of the retort; West uses a fixed shovel and a hook made to turn, which when being drawn out takes against the upper part of the retort; Darlington and Scott use a screw like a corkscrew; Rowbottom employs retorts open at both ends, and pushes the coke out with the bottom of the scoop; while Dunbar and Nicholson have hook rakes arranged in the interior of the scoop. In drawing retorts it is of importance to accomplish this quicker than it is possible with a rake, as the hand-drawing involves from twice to three times longer time than the charging. But if it be desired to draw a large quantity of coke in one pull, employing for this purpose (instead of the rake with turned-up end) a shovel at the end of the bar, the coke is so crushed together that it requires a considerable force to draw it out, and the retort is exposed to serious danger. If, however, instead of one, a number of rakes or blades are arranged one behind the other on the bar, then the coke is taken hold of in as many places when the bar is turned, and if the blades are at the right distance apart the crushing together of the coke is prevented. If instead of each of the blades a set or system of blades, or small shovels, or leaves be employed, which, while the bar is pushed in, are folded up, but so arranged that they spread out as a fan when the bar is turned, and thus spread over a whole cross section of the

coke, then it follows that the whole coke charge is divided off into as many portions as there are blade or fan sets or systems, and the sectional surfaces compressed by the cutting through of these blades enables the whole charge of coke to be drawn with one pull, without any great force being employed and without endangering the safety of the retort.

The drawing apparatus constructed according to this invention is on such principles. The apparatus proper and the carriage for supporting it may be made similar to the apparatus for charging retorts, and the moving of the carriage along the retorts may also be accomplished in the same way.

1623.—PINTSCH, J., and SCHÜLKE, J., Berlin, "*Improvements in the means and apparatus for kindling and extinguishing or reducing lights by electricity for signalling and other purposes.*" Patent dated April 23, 1878.

According to one method of operating to carry out this invention, there is provided in the passage through which the gas passes to the burner a chamber containing a small valve of soft iron, which, in seating against an orifice in the passage, prevents the gas from passing to the burner. The part of the gas-pipe or passage in immediate proximity to the valve constitutes the soft iron core of an electro-magnet, being surrounded by a coil, one end of which passes to a battery or induction coil, while the other passes to the earth, or to the coil of a similar apparatus on another burner, when more than one is operated. In connection with the electro-magnet and valve is a permanent magnet, arranged so as to polarize both the core and the valve in such a manner, that when no current is passing through the coil the core will attract the valve, and cause it thus to seat on the inlet orifice so as to cut off the gas supply. If, on the other hand, a current is passed through the coil in a direction such as to reverse or neutralize the polarity imparted to the core by the permanent magnet, the valve, in being repelled by the core, or drawn away by the magnet or by a spring, will open the orifice, and allow the gas to issue through the burner. At the same time, either a portion of the same current that is passing through the coil, or a separate current, is passed through two insulated platinum points immediately above the burner, so that by the electric spark produced the escaping gas is ignited. On again interrupting the current the valve closes, so as to extinguish the gas-flame. Instead of making the valve of soft iron, it may be constructed as a permanent magnet, so as to polarize a piece of soft iron employed in place of the permanent magnet.

1635.—WARNER, W. J., South Shields, "*Improvements in machinery and apparatus for charging and drawing gas-retorts, and for doing the work immediately in connection with them.*" Patent dated April 24, 1878.

This invention is based upon inventions for which letters patent, No. 2610, bearing date July 22, 1875, and provisional protection, No. 3953, dated Oct. 25, 1877, were granted to the present patentee.

The former invention is a machine, complete within itself, for raising the coal from the retort-house floor by an elevator with an endless chain of buckets, and depositing the coal by means of shoots into scoops; and for raising in a bucket by a lift the coke after it is drawn from the retorts, and carrying it over the framing of the machine, and discharging the bucket through openings in the wall of the retort-house. The latter invention is for improvements in the machine just referred to. Instead of a travelling frame a fixed beam is placed over the centre of each bed of retorts, and carried through openings in the walls to any convenient distance beyond, along which beam the carriage of a travelling lift runs. The very cumbersome framing of the machine necessary for the coke to travel over is thus dispensed with, and the coke can be stacked or stored without any expenditure of manual labour in trimming, as well as removed and deposited when drawn from the retorts. The latter machine was made still further more compact by substituting mechanical shovels for the chain and buckets for raising the coal, and by lifting and actuating the scoop and rake through a cylinder and piston placed immediately under the cradles for carrying these two tools, the motion for actuating the several parts of the machine on these cradles being conveyed from a centre or main driving-shaft to a grooved annular wheel working on the piston-rod; the scoop and rake being thus able to turn on their supports, the top ends of the piston-rods were more free to give to the inequalities of the work. For giving motion to the machine an engine was attached to it. Three parallel channels were arranged along the house, one for the coke buckets, another for the coal, and the third for the machine to travel in, the scoop, rake, and their cradles being just clear of the retort-house floor. The present invention is for still further improving and simplifying the machinery for charging and drawing the retorts, and for doing the work immediately in connection with them by mechanical means; that is to say, preparing the charge of coal for the scoop, and discharging the coke from the retort-house.

The improvements are the substituting of a fixed engine for a portable one, and driving the machine through the intervention of a square shaft and pendulous or bracket bearings. Two other shafts, running the whole length of the retort-house, are also employed, one for driving the overhead travelling lifts, the other underground for actuating self-feeding machinery for filling iron buckets with the charges of coal for the retorts. A channel just in front of the beds is built to take the coke buckets, and so allow the rake and scoop to pass over when they are in their lowest position. Another channel is also formed parallel with the coke channel, and running the whole length of the house. In this channel are fixed the feeding tools for filling the coal buckets, revolving arms or reciprocating ones being used and actuated by the underground shaft, the object being to draw out and partially break, if necessary, the coal from the bunkers or stores through gates or openings in the channel, and feeding coal into buckets which have been lowered by the overhead lift into the channel below the openings. Along this channel are fixed rails, forming a tramway for the machine proper, which is driven by the square shaft running also along this channel. The machine is carried by a quadrilateral frame mounted on wheels, and consists of two vertical cylinders, each fitted with a hollow piston or ram, into which a screw is received through a nut below, the screw being in length somewhat in excess of the difference in height between the highest and lowest retort.

On the top of the pistons, and free to turn, are the cradles for carrying the scoop and rake in action, each tool and lift being independent of the other. The retorts being placed at equal distances along the house, and the distance from centre to centre of the pistons being the same, the two tools are brought in succession to each retort, but with only one adjustment to each, as the machine travels along. Midway between the two pistons is placed the major shaft of the machine, driven through the intervention of mitre or bevel wheels in gear with the square main driving-shaft. From the major or vertical shaft of the machine two shafts are driven, square or slotted. These shafts are the length of the lifts, and are parallel to them, and are used for the purpose of actuating the rake and scoop through their mechanism, at whatever elevation they may be, by means of bushed spur-wheels. These wheels revolve with their bushes, and drive the shafts, but allow of their being raised and lowered with the cradles. At the top of each of the piston-rods is fixed an arm for carrying the square or slotted shaft working through the bushed wheel. At the top end of the shaft is a wheel resting on the arms for conveying motion to the annular wheel on the piston-rod, and thence through a pinion and bevel gear to a pulley for driving an endless chain for actuating the rake and scoop, the object being to allow the cradle on the top of the piston-rod to move freely about it, so that the scoop and rake may be the better adjusted to any irregularities that may exist in the retorts, and that too without affecting the independent action of the scoop and rake.

The cradle of the scoop is a D-shaped frame of rod or bar iron or steel, and somewhat longer than the retort and its mouthpiece. To this cradle is attached the gearing for communicating motion to the scoop, which is much in the usual form. On the back end or head is fixed a mitre wheel. Geared to this wheel is another, on the axis of which is a slotted arm, which forms a crank by taking hold of a pin fastened to an endless chain or band. This chain or band is passed over a pulley at each end of the cradle, and is driven through the intervention of the square or slotted shaft and wheels. It will be seen that in action a forward motion will, through the pin attached to the endless band, be given to the scoop, which is thus thrust into the retort, and then, through the intervention of the mitre wheels, by the crank-pin passing over or round the pulley, an axial movement is given to the scoop, the coals will be delivered in the retort, and the scoop withdrawn, being returned to its former position to receive its charge of coals, and receiving again an axial motion of a half turn through the crank-pin passing over the back pulley.

The action of the rake for drawing is in principle the same, being sent into the retort over the coke, and receiving an axial motion from the workman, thus thrusting the tool into the coke, which by a return movement is withdrawn. There is this difference, however, between the two—the axial motion is independent of the reciprocating motion, and under the control of the workman, so as to draw any portion of the charge at will. The rake and its shaft, which is attached near to the periphery of a cylindrical or annular headstock, and sufficiently less in diameter than the mouthpiece, to secure freedom in working, may be kept cool by a current of water being made to circulate through the shaft (which for this purpose should be tubular) from and to the headstock, it being made water-tight for this purpose. The rake may be also cooled by a stream of water flowing over it as it withdraws the coke.

The scoop cradle has attached to it a hopper which carries two scoops, each of the capacity of a charge of coal. These scoops turn on their axles only, and are for the purpose of taking the charge for two retorts in the tier of each bed from one bucket of coal. Thus when the machine is brought into position for receiving the charge, the bucket is lowered into the hopper, and the bottom of it being hinged, on its being opened and the bucket made to travel along the hopper, the coal is deposited in the two scoops ready for filling in succession the charging scoop as it is brought into position for charging. The hopper scoops being simply turned on their axes, the coal is discharged into the charging scoop as required.

With this machine two stacks may be worked face to face, a tier taken on one side, and then each tool and its cradle raised in succession to clear the other to swing round, and to draw and charge a tier upon the opposite side. With such an arrangement the coal stores may be placed parallel with the beds, and immediately behind the retorts, on either one or both sides of the house, in the same or separate buildings. The coke would then be stacked beyond the coal stores, or on the opposite side of the house if only one store be constructed, the plan of the machinery in connection with the lift and coal-feeders being arranged to suit the altered general plan. In houses to which the coal is delivered on the ground floor, a lift is constructed to raise a waggon, into which the coals are shot or delivered, and then raised by the lift and distributed by means of a waggon-way over the tops of the stores or bunkers, the lift being worked through a winch geared to one of the shafts running through the house.

The charging and drawing machine is propelled through bevel gearing connecting the main or square shaft with the axles of the carriage, through the major or centre shaft of the machine. A portable steam-engine or combined engines, fed through a flexible pipe, may be employed for this purpose and for driving the machine, and a steam lift may be employed for elevating the cradles and their tools; or hydraulic lifts may be employed in connection with the engine driving-shaft for working the pumps and driving the other parts of the machine, as already described. The lifts, whether steam or hydraulic, may be used directly under the cradles, and take the place of the nuts and screws and bevel gearing in connection with the major shaft through which they are actuated and adjusted.

APPLICATIONS FOR LETTERS PATENT.

4576.—EDISON, T. A., Menlo Park, U.S.A., "Improvements in electric lamps, and in the method of manufacturing the same." Nov. 10, 1879.

4577.—THORP, T., Whitefield, and TASKER, R., Prestwich, Lancs, "Improvements in apparatus for regulating the supply of gas to burners." Nov. 11, 1879.

4589.—HEINRICHS, C. F., Russell Square, London, "Improvements in apparatus for generating electric currents, also in electric lamps, and in the manufacture of carbons to be used therewith, part of which improvements is applicable to electro magnets generally." Nov. 11, 1879.

4590.—HARDING, G. P., Paris, "Improvements in apparatus and mechanism for electric lighting." Nov. 11, 1879.

4591.—GOTHARD, J., Chesterfield, Derby, "An improvement in and in means for treating or preparing coke." Nov. 11, 1879.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

1969.—LONGSDON, A., Queen Victoria Street, London, "Improvements in and connected with electric light apparatus or lamps." A communication. May 16, 1879.

2060.—BLANDY, A. F., Westminster, "Improvements in apparatus for electric lighting." May 23, 1879.

3057.—WHITE, W., Wimpole Street, London, "Improvements in apparatus or means for water regulating and waste preventing, and in the adaptation of same to the service of lavatories, closets, and such like purposes." July 26, 1879.

PATENT WHICH HAS BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

4283.—GENT, J. S., "Improvements in apparatus employed in the manufacture of gas-burners." Nov. 6, 1876.

PATENT WHICH HAS BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £100 BEFORE THE EXPIRATION OF THE SEVENTH YEAR.

3271.—BENNETT, W., "An improved automatic apparatus for the differential adjustment, reduction, and regulation of pressures, either of fluids, steam, or gases." Nov. 4, 1872.

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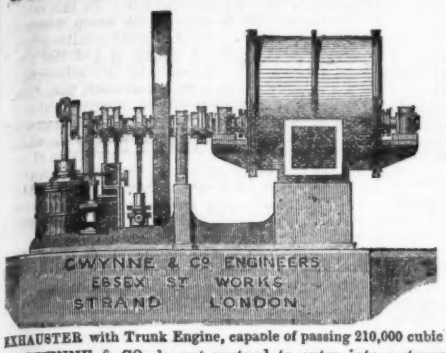

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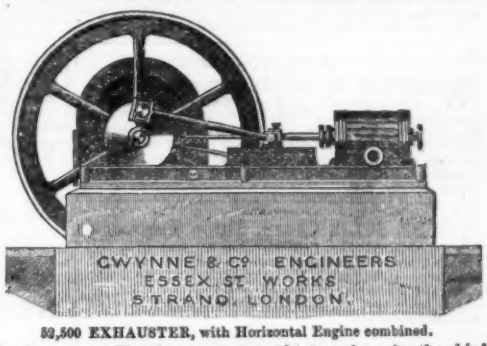

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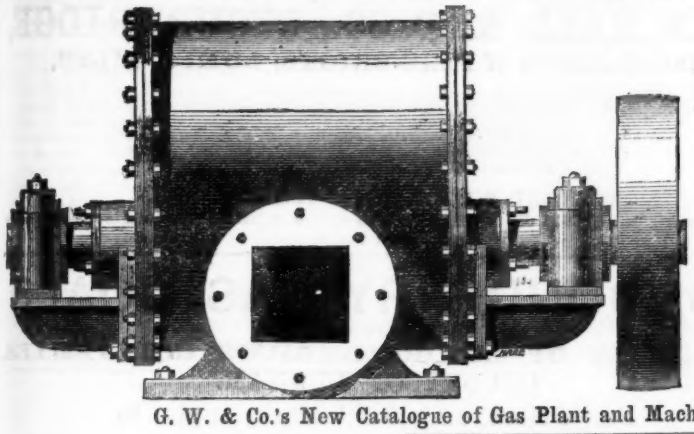

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TO TIMBER MERCHANTS.

THE Gas Committee of the Corporation of Stafford are open to receive TENDERS for 72 best Larch or Pitch Pine TIMBER PILES, each Pile to be 35 ft. in length by 12 in. square, delivered at Gas-Works, Stafford.
Tenders to be sent in on or before the 22nd inst., addressed to the undersigned, and endorsed "Tender for Piles."
JNO. STORER, Manager.
Gas-Works, Stafford, Nov. 4, 1879.

THE Directors of the Newmarket Gas Company are prepared to receive TENDERS for 25,000 Gallons of TAR at present in stock at their Works.
Tenders, stating price per gallon, delivered in Contractor's barrels, on rails at Newmarket Station, to be sent to the undersigned, on or before Saturday, the 29th inst.
By order,
THOMAS WILKINSON, Manager.

Less Heat, No Smoke,

White Light, & Economy.

SPECKSTEIN & LAVA
Gas-Burner Fabricants
On the most approved French and German principles.
These Burners can be made to consume from 1¼ feet to 20 feet of gas per hour, and to give a light from 4 to 150 candle power.
Terms and Discount on application.
Catalogue, 6d. Sample Burner, 1s.
AUGUSTUS WESTWOOD & CO., COMMERCIAL CHAMBERS, WEST BROMWICH.

BUENOS AYRES GAS SUPPLY.

To the Editor of
THE JOURNAL OF GAS LIGHTING.

SIR,—The attention of my clients, The Buenos Ayres Gas Company, Limited, has been called to a Caution appearing on page 680 of your issue of the 28th ult., by which it is stated that the holders of certain Mortgage Debentures issued by my clients, "will have no resort to the assets of the Buenos Ayres Gas Company represented by Louis Wilde, 42, South John Street, Liverpool." It is to be feared that, by causing confusion between my clients and the Company represented by Mr. Wilde, the advertisement referred to may occasion injury. I am, therefore, instructed to inform you that my clients are The Buenos Ayres Gas Company, Limited—an English Company formed under English law; whereas the Company represented by Mr. Wilde is an Argentine Company formed under foreign law, and having a Spanish name, which, if translated into English, is the "Old Gas Company."

Yours, &c.,
THE SOLICITOR OF THE BUENOS AYRES GAS COMPANY, LIMITED.
23, Queen Victoria Street, E.C.,
Nov. 12, 1879.

CORPORATION OF NOTTINGHAM—GAS DEPARTMENT.

EXHIBITION OF GAS-STOVES, ENGINES, BURNERS, AND OTHER APPARATUS FOR DOMESTIC AND MANUFACTURING PURPOSES, &c.

MECHANICS HALL, NOTTINGHAM.

The above EXHIBITION will be opened by
THE RIGHT WORSHIPFUL THE MAYOR,
SIR JAMES OLDKNOW, KT.,
And the SHERIFF, F. ACTON, ESQ.,
On Monday, the 24th of November, 1879, at Twelve o'clock, and continue until Saturday, the 29th of November.
Exhibitors will show the Stoves, Engines, &c., in use.
The charge for admission on Monday will be One Shilling each to Five o'clock, and after that time Sixpence; other days Sixpence to Five o'clock, and afterwards Threepence.
The Exhibition will be open from 11 a.m. to 9.30 p.m.
Refreshments will be provided.

GAS LIGHTING IMPROVEMENTS.

GEO. BRAY & CO.'S NEW PATENT LANTERNS.

See Page 794.

BOROUGH OF ROTHERHAM GAS-WORKS.

TO GAS-METER MANUFACTURERS.

THE Gas Committee of the Corporation of Rotherham invite TENDERS for the Supply and Delivery and Fixing of a STATION-METER, to pass 20,000 cubic feet of gas per hour.
For further particulars apply to Mr. James Goodwin, Manager.
The Corporation do not bind themselves to accept the lowest or any tender.
Sealed tenders, endorsed "Tender for Station-Meter," to be sent to me not later than Nov. 22, 1879.
By order,
GEO. W. HODGKINSON, Town Clerk.
Council Hall, Oct. 31, 1879.

G. E. TOURNAY,
RETORT-SETTER,
CONTRACTOR FOR THE ERECTION OF
Chimney Shafts, Retort Ovens, &c.,
ST. MARY'S STREET, WINCHEAP, CANTERBURY.

First-Class Testimonials.

M. DAVIS & CO., 27, Wellclose Square, LONDON, E.,
COMMERCIAL GLASS WORKS.

BEST OPAL SHEET GLASS, IN CASES OF 200 FEET.

150 Y	7d. per foot.	26 Y	11d. per foot.
21 Y	9d. „	32 Y	1s. 3d. „

Enamelled Sheet Glass, Flint and Opal, 1s. 2d. Coloured Glass and Opal, 1s. 6d. to 2s. 6d. per foot.
GAS GLASSES OF ALL DESCRIPTIONS ON HAND; SPECIAL PRICES FOR QUANTITIES.

JOHN HALL AND CO., STOURBRIDGE,
Manufacturers of FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.
N.B.—A Stock of 15 and 16 in. CIRCULAR RETORTS always on hand. Other kinds made to order on short Notice.

LONDONDERRY GAS COALS
DIRECT FROM THE
MARQUESS OF LONDONDERRY'S COLLIERIES.
COUNTY OF DURHAM.
For Prices and Particulars, apply to
MR. S. J. DITCHFIELD,
LONDONDERRY OFFICES, SEAHAM HARBOUR, COUNTY OF DURHAM.
London Agents: Messrs. LAMBERT BROS., 85, GRACECHURCH ST., E.C.

Now ready, Second Edition, price 7s., by post 7s. 3d., the
GAS MANAGER'S HANDBOOK.
By THOMAS NEWBIGGING, M.I.C.E.

Orders to be sent to
WALTER KING,
11, BOLT COURT, FLEET STREET, LONDON, E.C.

B. DONKIN & CO.'S
IMPROVED GAS-VALVES
WITH WROUGHT-IRON PINIONS.

These Valves are proved on both sides to 30 lbs. on the square inch before leaving the works, and are kept in stock.
In ordering Valves, please state whether required for under or above ground, and if to be with flanges or spigots and sockets cast on, or with separate spigot and socket pieces.
Also Sole Makers of
J. BEALE'S NEW PATENT GAS EXHAUSTERS,
and Makers of
STEAM-ENGINES FOR DRIVING GAS EXHAUSTERS,
VALVES FOR AMMONIACAL LIQUOR,
IMPROVED BRIDGE VALVES FOR REGULATING THE SEAL IN HYDRAULIC MAINS,
BYE-PASS VALVES, SCREW WATER-VALVES, &c.

B. DONKIN & CO., BERMONDSEY, LONDON, S.E.

J. & H. ROBUS,

BUILDERS AND CONTRACTORS

FOR THE ERECTION AND REBUILDING OF GAS AND WATER WORKS,

RETORT-SETTING—A SPÉCIALITÉ.

ROBUS'S IMPROVED RETORT-SETTINGS, guaranteed to Carbonize a large amount of Coal with a small per cent. of Fuel.

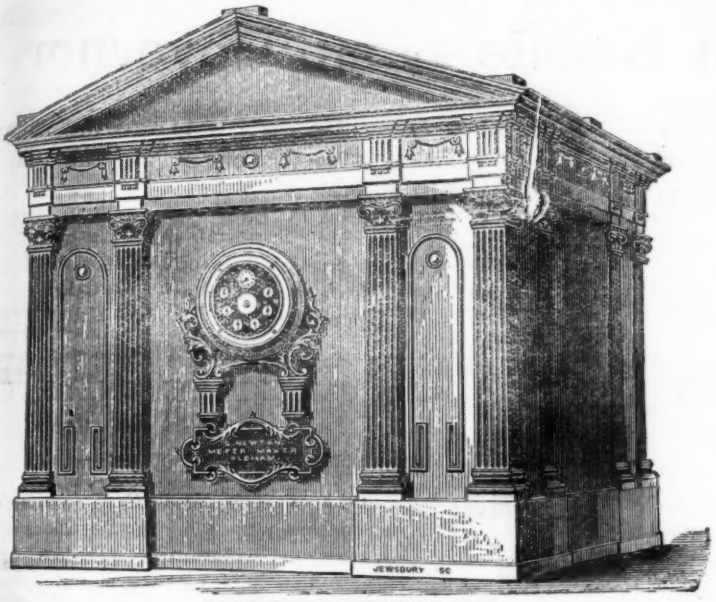
ESTIMATES GIVEN FOR MAIN-LAYING.

N.B.—All kinds of Fire Goods and Gas Apparatus supplied on the shortest notice.

Address:—J. & H. ROBUS, BELL GREEN, CATFORD, LONDON, S.E.

GEORGE NEWTON,

UNION STREET WEST, OLDHAM,



MANUFACTURER OF

SQUARE STATION-METERS, with PLANED JOINTS;

ROUND STATION-METERS, WITH CAST-IRON STANDS;

WET AND DRY CONSUMERS GAS-METERS, GOVERNORS, &c.

THE Gloucester Gas Company, ceasing to manufacture gas at their old works, will have the undermentioned APPARATUS for Sale about the beginning of August, viz.:—

110 Mouthpieces, D-shape, 13 in. by 22 in., with Wrought-Iron Lids, Cross-Bars, Stand, Bridge, and Dip Pipes. Also about 150 feet of D-shape Wrought-Iron Hydraulic Main, size 19 in. by 19 in. 28 Mouthpieces, D-shape, 16 in. by 20 in., with Wrought-Iron Lids, Cross-Bars, Stand, Bridge, and Dip Pipes. Also about 38 ft. of D-shaped Wrought-Iron Hydraulic Main, size 20 in. by 20 in. Annular Condenser, consisting of six Vertical Pipes, 24 in. diameter, 19 ft. high, with three 12 in. Slide-Valves and 12 in. Connections.

Scrubber (round), 5 ft. by 20 ft., with three 12-in. Slide-Valves, and 12 in. Connections.

Exhauster (Jones) to pass about 15,000 feet per hour.

Exhauster (Beales) to pass about 25,000 feet per hour.

Two Vertical Steam-Engines, each about 6-horse power, with Pulleys, and Shafting used for driving the above.

Boiler 14 ft. 6 in. by 8 ft. 6 in., with Centre Tube, and four Galloway Patent Tubes.

4-horse power Horisontal Steam-Engine.

Three 4-in. Pumps, with cranked Shafting and a pair Mitre Wheels.

Set of four Purifiers, 12 ft. by 12 ft. by 4 ft., with 12-in. Centre-Valve (Cockeys), and Connections and Lift complete.

Station-Meter by A. Wright and Co., London, with three 12-in. Slide-Valves, and 12-in. Bye-Pass and Connections, to pass about 25,000 feet per hour.

Gasholder, Double Lift, with Cast-Iron Tank, capacity 37,000 feet.

Gasholder, Double Lift, capacity 100,000 feet.

Gasholder, Double Lift, capacity 240,000 feet.

Two 12-in. Governors, by Wright, London, with 12-in Valves, Bye-Pass, and Connections.

Two 12-in. four-way faced Valves, by Cockey.

For further information, &c., apply to the undersigned.

R. MORLAND, Engineer.

THE

IMPERIAL METER CO.,

LIMITED,

Makers of THE IMPROVED DRY GAS-METERS, THE PATENT WET GAS-METERS, Special Meters for Public Lighting, STATION-METERS, Governors, &c.

KING'S ROAD, ST. PANCRAS,

Formerly also (Walter Ford) at Gray's Inn Road.

Now ready, price 6d. and 1s.

THE

SOFTENING AND PURIFICATION OF WATER

ON AN IMPROVED SYSTEM.

PART I. explains the application of the system to large or small supplies for Private Mansions, Schools, Colleges, Asylums, Hospitals, Public Institutions, &c. Price 6d.

PART II. treats of the application of the system to large supplies for Water-Works and for Manufacturing Purposes, Paper Mills, Breweries, Bleach Works, the Prevention of Incrustation in Steam Boilers, stationary or locomotive, &c. It also contains extracts from Tables of Analyses, and Notes on Water Supply, specially useful for reference in connection with the question of Water Softening and Purification. Price 1s.

F. H. ATKINS & CO., ENGINEERS,

62, FLEET STREET, LONDON, E.C.

ECONOMY IN THE PRODUCTION OF GAS.

PLUTONIC CEMENT,

FOR JOINTING AND REPAIRING RETORTS AND OVENS *in* ACTION AND *out* OF ACTION.

A Pamphlet on the advantages of the above, with Modes of Application, References, Prices, &c., free by post, from the Sole Manufacturer,

WILLIAM RICHARDSON, Gas and Hydraulic Engineer, CHARLES HENRY STREET, and BISSELL STREET, BIRMINGHAM.

HONOURABLE MENTION,

J. E. WILLIAMS & CO.,

PARIS EXHIBITION, 1878.

SOLE MANUFACTURERS OF THE

SPECIAL METALLIC OXIDE PAINT,

VICTORIA PAINT WORKS, COLLYHURST, MANCHESTER.

G. J. EVESON

Has on Sale a large quantity of Cannel, South Yorkshire, Wigan, and Ruabon Coal, purchased previous to the late advances.

Prices on Application.

GAS COAL AND CANNEL CONTRACTOR, BIRMINGHAM.

LAMBERT BROTHERS, WALSALL.

ALPHA TUBE & FITTING WORKS

Manufacturers of W. J. WARNER'S PATENT MARKET GAS STAND-PIPE.

Now ready, GAS CHANDELIER BOOK (Reduced Prices), 7s. 6d.

The Royal Scottish Society of Arts, on Monday, the 10th inst., awarded to D. BRUCE PEEBLES the **Keith Medal** for his invention of the Needle Gas Governor. The Committee appointed by the Society to examine the merits of the Needle Governor, consisting of the following eminent scientific gentlemen, viz.:—Dr. Stevenson Macadam, John Reid, Esq., late of the Edinburgh and Leith Gas-Works, and John Milne, Esq., Milton House, summed up their report by stating, "Your Committee have had the advantage and privilege of experimenting with the Needle Gas Governor, and are convinced that this Governor is the most perfect instrument which has been invented up to this time for controlling the flow of gas."

Peebles' Patent Needle Lamp Governor.

DR. ROBERT FERGUSON, F.R.S.E., President of the Royal Scottish Society of Arts, discussing the merits of the instrument, said:—

"The Needle Governor is the *ne plus ultra* of a gas-burner. Mr. Peebles has produced the best Governor that ever has been invented."

DR. STEVENSON MACADAM, F.R.S.E., F.C.S, Professor of Chemistry, Surgeons Hall, Edinburgh, said:—

"It is an admirable piece of apparatus, extremely simple, and has in my opinion revolutionized our idea of what a true and serviceable regulator of gas really is."

From DR. W. WALLACE, F.R.S.E., F.C.S., Gas Examiner for the City of Glasgow:—

"Many thanks for the Governor. I think you may say 'Eureka,' for this is the thing we have all been searching for, but hitherto without success."

From JAMES PATERSON, Esq., C.E., F.G.S., Past President of the British Association of Gas Managers:—

"I have put the Needle Gas Governors to the severest test with—and without—various sizes of burners, and under varying pressures, with at practically disturbing the constant of quantity."

Peebles' Patent Needle Governor Gas Burners

FOR SAVING GAS BY DEVELOPING ITS FULL ILLUMINATING POWER.

(HALF SIZE.)

These unequalled Burners are made to fit all kinds of brackets, gaseliers, &c., and are the only reliable self-acting Gas-Burners made of a size suitable for ordinary use.

It is a well-ascertained fact that by an increase of only 14-10ths pressure upwards of 50 per cent. of gaslight is lost to the consumer. These Burners automatically prevent an increase of pressure, and therefore prevent waste. They also obviate flaring and hissing, and prevent the unconsumed gas from vitiating the atmosphere. The new Cornelian Globes supplied by us have wide openings at top and bottom. They are rapidly superseding those of the old form, and yield much better results.

HALF SIZE.

Price 1s. 6d.

To screw into Brackets, Gaseliers, &c.

D. BRUCE PEEBLES & CO.,

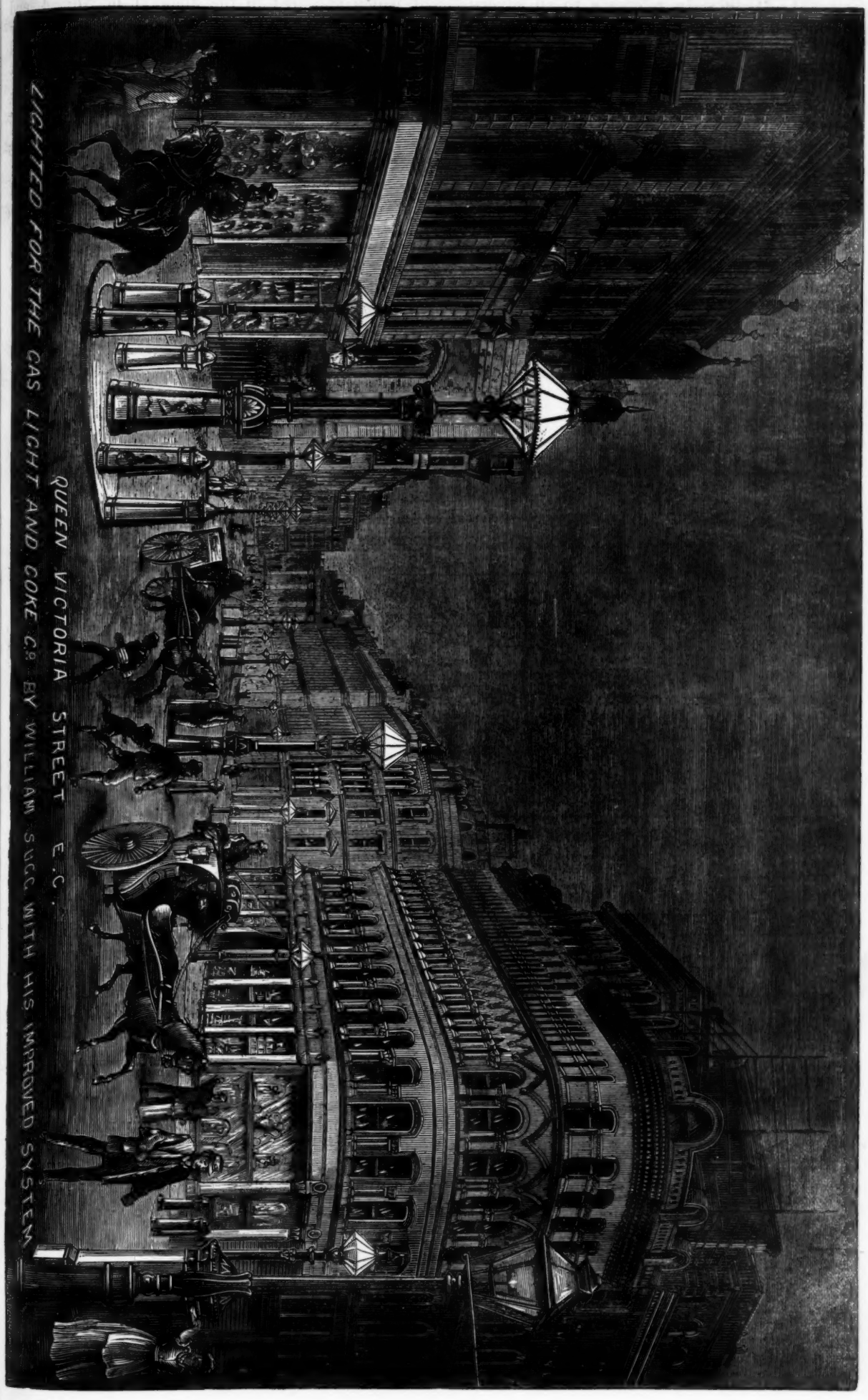
GAS ENGINEERS,

TAY WORKS, BONNINGTON, EDINBURGH,

MANUFACTURERS OF WET AND DRY GAS-METERS,
GAS GOVERNORS OF ALL KINDS, AND GAS APPARATUS GENERALLY.

London Agents—Messrs. HODGE & Co., 100, Hatton Garden.

Dublin Agents—Messrs. PHENIX & STANDING, 10, Leinster Street.


QUEEN VICTORIA STREET E.C.
LIGHTED FOR THE GAS LIGHT AND COKE Co. BY WILLIAM SUGG WITH HIS IMPROVED SYSTEM

NOTICE.—In reference to an advertisement which appeared in the JOURNAL of Nov. 4, and some time previous, containing the statement that "comparative experiments . . . . conclusively prove that the 'Sugg' burners give over 30 per cent. of illuminating power more than can be obtained from any other burners with the like quantity of gas," which statement purports to be based on a report given by Messrs. C. Meymott Tidy, M.A., M.B., T. N. Kirkham, M.I.C.E., F.C.S., and Charles Heisch, F.C.S., we think it right to state that, having written to these gentlemen asking for a copy of their report, they reply that they are unable to furnish us with one, as it was a private one of Mr. Sugg's, and two of the gentlemen inform us that **not only were our burners not mentioned in the report they gave, but that they were not even tested.**

The names of the above eminent scientists being associated with the report, gives it an importance it would not otherwise possess; hence the above notice.

We may also state that the report of the Committee of the British Association formed "to inquire as to the best means of consuming coal gas of different qualities," which was presented at the 1878 meeting, and reported in the JOURNAL, showed that, of the two or three score burners tested, which included all those of repute in the market, **Bray's yielded the highest lighting power**, and had the fewest defects—such as "smokes," "blows," &c.—recorded against them.

STREET-LIGHTING IMPROVEMENTS.

BRAY'S

PATENT LANTERNS & FLAT-FLAME BURNERS

Of 30 to 200 CANDLES POWER.

This Apparatus has the following merits, viz.:—

The Burners are of the flat-flame type, which is the only practicable type for Street-Lighting purposes.

Their lighting power is greatly in excess of Flat-Flame Burners made prior to the introduction of these, and, the up and down light being taken into account, it is in excess of that yielded by any Burners, Flat-Flame or otherwise.

The flame in the lantern is remarkable for its steadiness, whiteness, and brilliancy.

The lantern is storm-proof, its efficiency not being materially affected in a gale of wind.

It is practically shadowless, though the top light is allowed to pass freely to the upper parts of buildings, instead of being reflected, in the main, round the base of the lamp, as in some systems.

These Lamps were first exhibited in connection with the Leeds Gas Exhibition, in front of the Town Hall, in conjunction with all the improved systems of Street Lighting now before the public, when the opinions expressed by Gas Engineers and the Public were that this apparatus yielded more light and diffused it better than the other systems there tried. Since this Exhibition they have been improved in several important features, the principal of these being an arrangement whereby the flame is kept in a state of efficiency in the stormiest weather.

So long as we could see any desirable improvement to be effected, we have avoided, as far as possible, sending out our lanterns, or making any public announcement regarding them. We now feel convinced that our apparatus is nearer perfection than any in the market, and offer it with complete confidence.

Price and Particulars on application to

GEO. BRAY & CO.,

LAMP AND "ENAMEL" BURNER MANUFACTURERS,

LEEDS.

F. & C. OSLER,

45, OXFORD STREET, LONDON, W.

MANUFACTORY AND SHOW-ROOMS:

BROAD STREET, BIRMINGHAM.

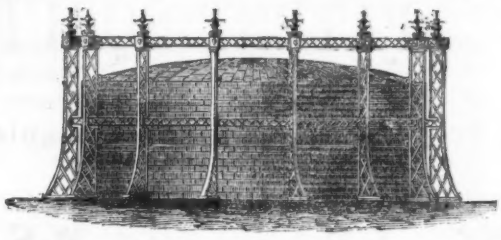
ESTABLISHED 1807.

MANUFACTURERS OF CRYSTAL GLASS CHANDELIERS,

WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES.

TABLE GLASS OF ALL KINDS.

CHANDELIERS IN BRONZE AND ORMOLU. MODERATOR LAMPS.



THE HORSELEY COMPANY,

LIMITED,

TIPTON, STAFFORDSHIRE.

LONDON OFFICE:

6, WESTMINSTER CHAMBERS, VICTORIA STREET,

GAS ENGINEERS, IRONFOUNDERS, &c.,

MANUFACTURERS OF

GASHOLDERS, WROUGHT AND CAST IRON TANKS, CONDENSERS, PURIFIERS, SCRUBBERS, MAINS, RETORT-LIDS, PLAIN AND DISHED, LAMP-POSTS, PIPES,

AND ALL REQUISITES FOR EITHER

GAS OR WATER WORKS;

ALSO

MAKERS OF ROOFS, BRIDGES, &c.

S. OWENS & CO.,

HYDRAULIC, GAS, AND GENERAL ENGINEERS,

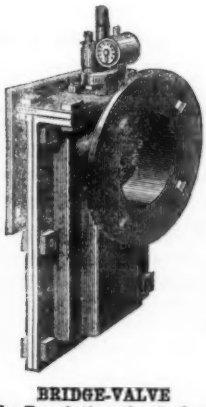
WHITEFRIARS STREET, LONDON, E.C.

Sole Manufacturers of MANN & OWENS'

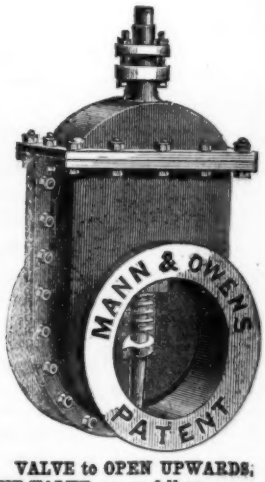
PATENT SCREW & CAM GAS-VALVE,

Protected by Royal Letters Patent in England, France, Belgium, & the United States of America.

VALVE to OPEN DOWNWARDS.



BRIDGE-VALVE
for Regulating the Seal of Hydraulic Mains.



VALVE to OPEN UPWARDS.

The SPECIAL ADVANTAGES of MANN AND OWENS' PATENT VALVE are as follows:—

1. Its non-liability to become set fast through varying temperature or from the deposit from crude gas. 2. It is made absolutely gas-tight by the simple action of a screw and cam. 3. Inconvenience through the breakage of springs or wedges setting fast cannot arise. 4. The face of the Valve is scraped and cleaned of any solid matter at each operation of opening or closing.

The Valve can be had to work either in a Vertical or Horizontal position.

Every Valve is carefully tested under pressure, and warranted perfectly sound and gas-tight.

INSTRUCTIONS FOR ORDERING.

State whether required for above or below ground, if Double Flange or Socket and Spigot Valves are wanted, or with loose Flanged Socket and Spigot pieces.

The Prices include Indicators to show extent to which Valve is open.

Also makers of PILLAR-VALVES, SELF-ACTING BYE-PASS VALVES, OUTSIDE RACK AND PINION VALVES, HYDRAULIC-MAIN VALVES, DISC-VALVES, &c.

Every description of Pumping Apparatus, Hydraulic Lifts, &c., suitable for use in Gas-Works, made to order.

PRICES, SIZES, AND FULL PARTICULARS, WITH COMPLETE ILLUSTRATED CATALOGUE, FURNISHED ON APPLICATION.

WANTED, by Samuel Thompson & Co., Colliery Office, Lancaster, APPLICATION for PRICES from Gas Managers who are prepared to receive Tenders for GAS COAL or CANNEL.

John Leigh, Esq., M.R.C.S., F.C.S., &c., &c., in his analytical report of S. T. & Co.'s Coal, says: "It is remarkable for its purity, I have scarcely ever examined a Coal containing so small a quantity of ash, and when Cannel of the best description is scarce, it may well replace this material."

SWANWICK CANNEL.

Illuminating power, 34 candles. Good Coke, 11¼ cwt. to the ton.

For analysis, prices, and references, apply to

H. BOAM, Litchurch Villa, DERBY.

GAS COAL.

THE Tawd Vale Colliery Company, Limited, are prepared to Contract for the Supply of their superior Arley and other GAS COALS, and to send samples to the order of Gas Engineers and others, or complete analysis on application. Shipped at Liverpool, Preston, Fleetwood, Garston, or Birkenhead.

Mr. James Paterson, C.E., F.G.S., in his analysis of T. V. Arley Coal, says: "Some parts merge into a semi-Cannel; Gas per ton, 10,300 cubic feet; illuminating power, 16·96 candles; coke of high quality, 1431 lbs. per ton."

Collieries, Skelmersdale, near Ormskirk; Offices, 5, New Hall, Old Hall Street, LIVERPOOL.

W. C. HOLMES & Co.,

ENGINEERS AND CONTRACTORS

FOR

GAS AND WATER-WORKS,

HUDDERSFIELD.

REFERENCES TO UPWARDS OF 400 WORKS.

E. & W. H. HALEY,

IRONFOUNDERS & MAKERS OF

CAST-IRON PIPES

FOR

GAS, WATER, & STEAM.

LISTER HILLS FOUNDRY,

BRADFORD, YORKSHIRE.

ASBESTOS,

INDESTRUCTIBLE FUEL FOR GAS-FIRES.

REDUCTION IN PRICES.

Apply for Price List and Samples to the Original Manufacturer,

THOS. REYNOLDS,

100, ASTON ROAD, BIRMINGHAM.

TROTTER, HAINES, & CORBETT,

BRETTELL'S ESTATE

FIRE CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASS-HOUSE FURNACE & BLAST-FURNACE BRICKS LUMPS, TILES, and every description of FIRE-BRICK.

Proprietors of

BEST GLASS-HOUSE POT and CRUCIBLE CLAYS.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

JOHN ROMANS, C.E., F.G.S.E.,

CONSULTING GAS ENGINEER

AND

CANNEL COAL FACTOR,

30, St. Andrew Square, EDINBURGH.

Plans and Estimates furnished; Gas-Works, Apparatus, Pipes, Machinery, Fire Goods, &c., supplied, or Attested and Shipped for Exportation.

GAS-WORKS TAKEN ON LEASE.

Mr. ROMANS has for upwards of 30 years been practically engaged in th Manufacture of Gas, and has, by extensive experiments, ascertained that by JUDICIOUS INTERMIXTURE of the lighter with the heavier gases, much of the rich Hydrocarbons CAN BE SAVED, which otherwise ARE LOST, during the process of manufacture. He is therefore enabled to give advice to those who favour him with their orders for Cannel, as to the class which will secure for their standard of illuminating power the HIGHEST ADVANTAGEOUS RESULTS.

ANALYSIS AND PRICES FORWARDED ON APPLICATION.

C. & W. WALKER,
8, FINSBURY CIRCUS,
LONDON, E.C.

MANN & WALKERS' PATENT SCRUBBER.

By Letters Patent in Great Britain, Europe, and the United States of America.

By some important improvements recently patented, the purifying power of these Scrubbers has been much increased, and a stronger ammoniacal solution obtained, which is found to absorb a large portion of the carbonic acid contained in gas, effecting an important saving in money and labour in the lime purifiers, and where oxide only is used, the increase in the illuminating power of the gas obtained by these Scrubbers is shown in a remarkable degree, in consequence of the large quantity of carbonic acid removed from the gas.

It is to be particularly noted that the important results of these Scrubbers do not depend upon the machinery alone. The entire internal construction of the Scrubber bears an almost equally important part. For this reason, where it is desirable to convert existing Scrubbers, whose dimensions happen to be suitable, the work commences by ripping out the whole of the interior of the shell, and beginning the internal construction *de novo* from bottom to top.

Fifty million cubic feet of gas per 24 hours are purified from ammonia by these Patent Scrubbers in a winter's day in the gas-works of London, where the purity of gas supply is the highest in the world, under the chemical restrictions of the Board of Trade.

Generally, wherever a high standard of purification is maintained in the chief cities and towns of the British Provinces and of Europe, these Scrubbers have become established.

By their use the department of purification from ammonia upon a gas-works is made complete, without the aid of prepared oxide of iron, chemicals in purifiers, or any other supplementary process, and the whole ammoniacal residual product contained in the coal is absorbed and obtained in the form most profitable to a gas company, while the requirements of all Acts of Parliament and of the Board of Trade, relating to incorporate gas companies, are satisfied.

Foul Gas, properly condensed, entering the inlet is, by once only passing through the Scrubber, completely purified from ammonia with regular certainty day by day, without any further trouble, or any other process, effected by a very small quantity of clear water let into the machinery room at the top of the Scrubber, which is discharged at the liquor outlet at the bottom, from Newcastle coal at about 18 to 20 ounces strength, from Yorkshire and other coals, generally from 25 to 30 ounces strength; while acidulated litmus or turmeric exposed at the Scrubber outlet will not show the slightest discoloration, and there is not a quarter of a grain of ammonia per 100 feet left unabsorbed.

They contain their own engine power, requiring only a small inappreciable quantity of steam from the gas-works boiler, and are then complete in themselves, ready for service.

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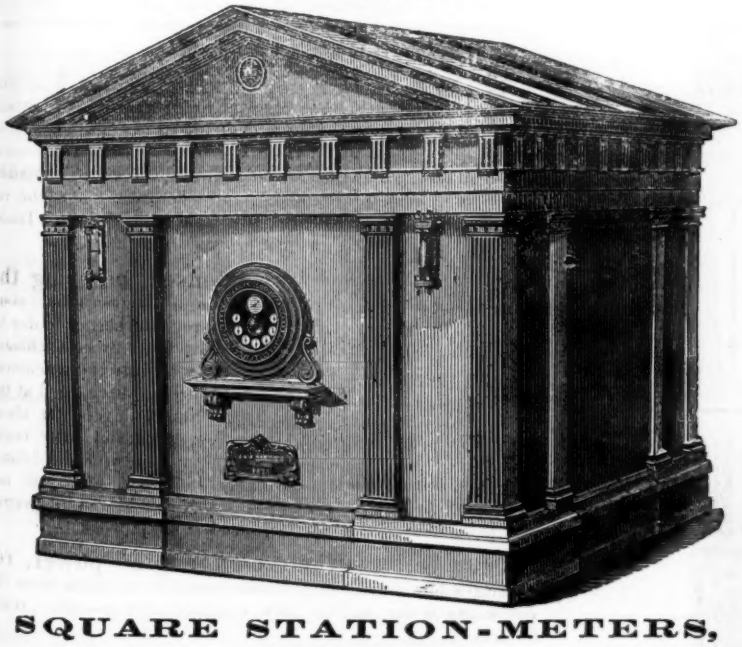

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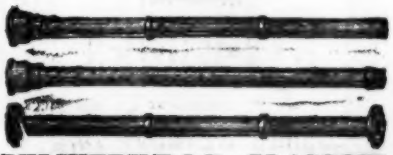

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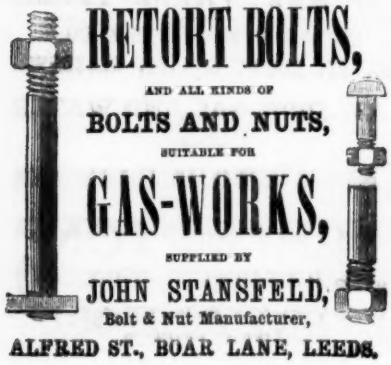

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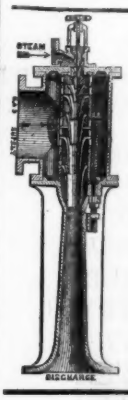

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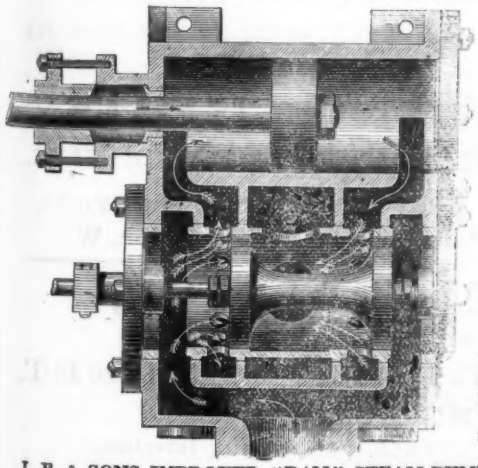

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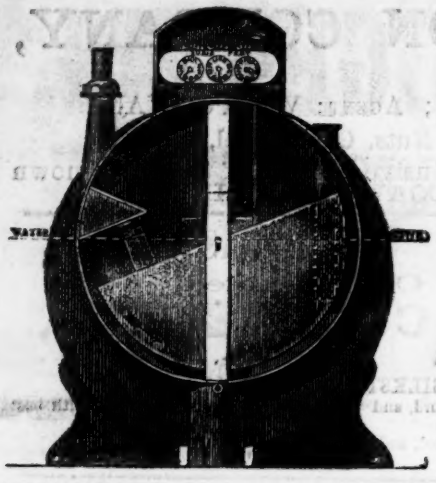

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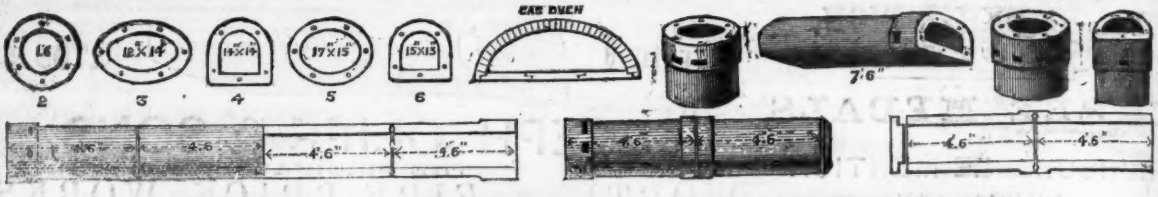

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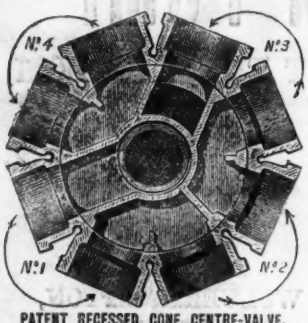

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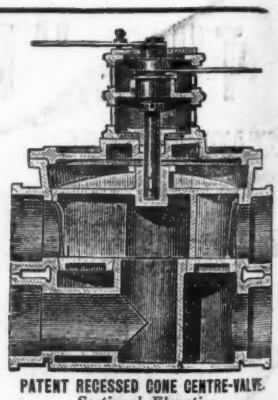

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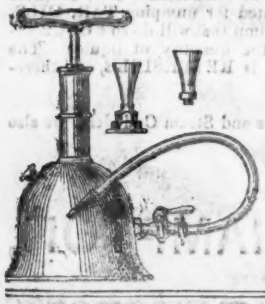

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